United States Department of Agriculture

Forest Service

Pacific Northwest Region

December 2011

Environmental Assessment for Illabot Road Project

Mount Baker-Snoqualmie National Forest

Retaining wall slump repair

Upper Illabot Creek

Upper Jordan Lake

Slumping road section

Contents

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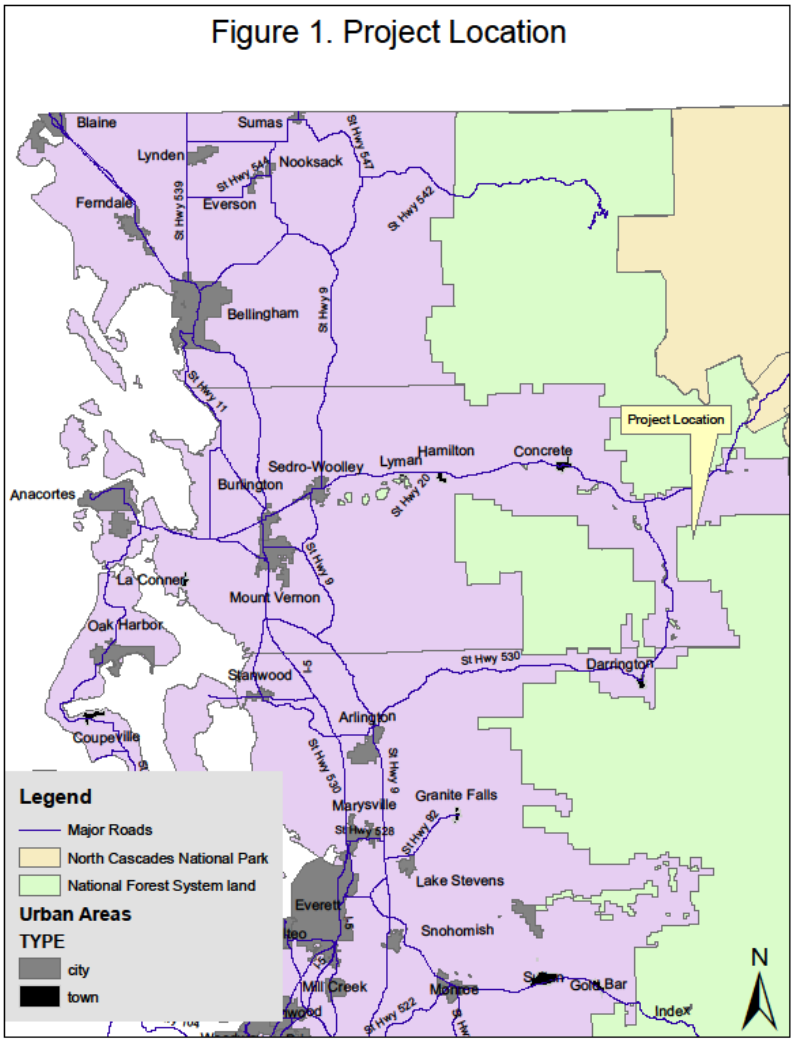
CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

Introduction

This Environmental Assessment (EA) analyzes the effects of five alternatives of managing the Illabot Road (Road 16). Each alternative has differing effects on the ease of human access to recreation and Tribal use areas, on water and fish habitat quality, and on the ability to perform adequate road maintenance.

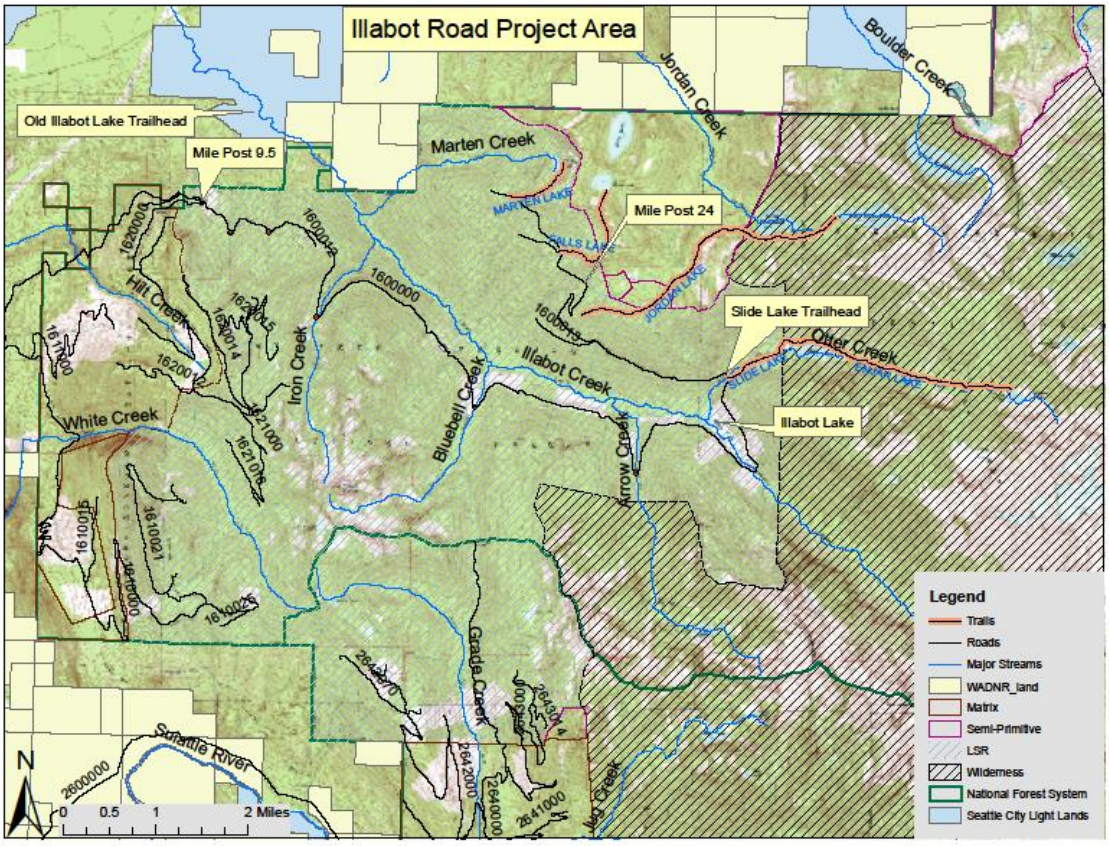
The project area, accessed by State Route 530, is located approximately 15 miles east of the town of Concrete and 13 miles north of Darrington, Washington (Figure 1). The legal description of the project area includes numerous sections in Township 34 north, Ranges 10 and 11 east.

Figure 1. Project Location



Most of Road 16 was constructed on National Forest System lands in the early 1960s to provide access for timber harvest in the Illabot Creek watershed (Figure 2). At that time, there was no trail to Slide Lake. However a trail to Illabot Lake began on private land approximately 1.5 miles north of the National Forest boundary and followed the south bank of Illabot Creek. The Slide Lake Trail (Trail 635) developed after road access was created and a user created trail developed from Slide Lake to Enjar Lake. Trail access to Jordan, Falls, and Marten Lakes originated mostly from private timberlands to the north. Road closures on private land and the extension of Road 16 in the 1980s resulted in the development of the user-built trails originating from Road 16 that now access Jordan, Falls, and Marten Lakes. Trails originating from Road 16 are the easiest access to these wilderness lakes and one of three main access points for the northwest portion of the Glacier Peak Wilderness Area.

Figure 2. Illabot Road Project Vicinity Map.



Illabot Creek is an important anadromous fisheries resource, and is a major tributary to the Skagit River, which provides an estimated 30% of the young anadromous fish entering salt water in Puget Sound. Illabot Creek contains Chinook, coho, as well as sea-run and resident populations of cutthroat, rainbow (steelhead), and bull trout.

The Illabot Creek watershed east of the junction with Road 1620 is either Late Successional Reserve or Wilderness. Since there is no planned timber harvest from these areas, Road 16 beyond its junction with Road 1620 is used for trail access and dispersed recreation.

Much of Road 16 was constructed at slope breaks, using excavation techniques with uncontrolled fill placement and inadequate drainage systems. The road had some drainage correction competed as recently as 1995, however, road fill slope failures continue to occur, and some have been noticeable contributors of sediment to Illabot Creek. Erosion and sedimentation from these events resulted in reduced water quality, burial or scouring of spawning gravels, and loss of fish habitat.

From Mile Post (MP) 10 to MP 18, Road 16 is highly susceptible to road prism slumping on the downhill side and upslope material sliding onto the road surface. Side slopes in this road segment average at least 60% with long distances of 80% to 100% slopes. At many locations along this road segment water seeps down rock faces on the road's uphill side into the road prism and under the road resulting in a high frequency of road slumps and upslope slides. Because of the susceptibility of Road 16 to slumps and slides, road maintenance costs are higher for this road than other roads on the Ranger District.

Repairs to these steep sections of road slopes would be very expensive and in some cases may not be repairable without extensive road shifts into vertical rock cliffs that are cost prohibitive. Furthermore, most culverts on Road 16 have exceeded their life expectancy. These culverts are undersized for adequate drainage and need to be replaced with larger culverts and additional cross-drains.

For more than ten years, funding has not been sufficient to maintain all of the roads on the Mount Baker Ranger District. To adequately maintain the 445 miles of drivable roads on the District would require more than $400,000 each year. The average annual road maintenance budget, including non-recurring funding sources, has been $152,000 over the last six years. Limited road maintenance funds have been used mostly to maintain vehicle access on as many roads as possible by brushing road sides and blading road surfaces. As a result, maintenance of drainage structures (culverts, ditches, etc.) was not sufficiently performed, road signs were not replaced, and surfacing was rarely replaced. The insufficient maintenance of drainage structures has likely contributed to increased rates of road damage due to storm events.

Following the National Forest Service Roads Policy of 2001, the District has been reducing the number of miles of drivable roads to address the 2001 Policy goals of a safe, environmentally sound road network that is responsive to public needs and affordable to manage. Given the declining road maintenance budget projections, only through further reductions in the total miles of road requiring maintenance can all the remaining drivable roads receive the maintenance needed to reduce flood damage to roads and attain the desired level of road surfacing, safety, and signage.

In addition to the Forest Service Roads Policy, The Mt. Baker-Snoqualmie Forest Plan, as amended, includes Forest-wide standards and guidelines that provide direction for the management of roads on the District. The Forest Plan directs employees to develop and implement projects to correct road related water quality, anadromous fish habitat, and other resource problems; and to operate, maintain, and/or close roads to meet established road management objectives and safety (Forest Plan p. 4-140). As a result of the limited funding for road maintenance and the high cost of maintaining Road 16; the lower level of recreation use in the Illabot watershed compared to other areas on the District; and the high-value fish habitat in Illabot Creek, Road 16 is a candidate for closure to better meet the Forest Service Roads Policy.

Proposed Action

Briefly the proposed action is to:

Decommission 16.07 miles of the Illabot Creek Road (Road 16) from mile post 9.5 (its junction with Road 1620) to mile post 25.57 (location where bridge was pulled approximately 0.6 miles from the road terminus). Spur roads 1600.013 and 1600.019 would also be decommissioned.

Upgrade Road 16 between MP 8 (National Forest boudary) and 9.5 (its juction with Road 1620), Road 1620 between mile posts 0 and 3.0 (junction with Road 1620.012), and 1620.012 between mile post 0 and the rock quarry by replacing all existing culverts, adding additonal culerts, and adding road surfacing.

A more in-depth description of the proposed action is found in Chapter 2.

Purpose and Need for Action

There is a need for a reduction in the total cost of maintaining roads on the Mount Baker Ranger District so that adequate maintenance is performed on roads remaining open to vehicle traffic.

There is a need for a reduction in the risk of failure of Road 16 and the resultant sediment production that would reduce water and fish habitat quality in the main stem and lower tributaries of Illabot Creek.

There is a need to retain vehicle access to private land on Road 16 between Mile Post 8 and 9.5.

The purpose of the Illabot Road Project is to reduce 16.07 miles of Road 16 and reduce long-term annual road maintenance needs by $8,500. The purpose also includes reducing the risk of degrading water and fish habitat quality in Illabot Creek.

Relationship to the Forest Plan and Other Documents

The proposed action tiers to the Final Environmental Impact Statement (FEIS) for the Mount Baker-Snoqualmie Land and Resource Management Plan (USDA FS, 1990), as amended. Major amendments include:

- The FEIS on Management of Habitat for Late-successional and Old-growth Related Species Within the Range of the Northern Spotted Owl, as adopted and modified by the April 1994 Record of Decision (ROD), which provides additional standards and guidelines (also known as the Northwest Forest Plan);
- The Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA, USDI 2001); and
- The Pacific Northwest Region Invasive Plant Program Record of Decision for Preventing and Managing Invasive Plants (USDA 2005)

Land Allocations

The following four land allocations (Figure 3) are found on NFSL in the analysis area:

Congressionally Reserved Areas: The Glacier Peak Wilderness.

Late-Successional Reserves (LSR): The main objectives for these reserves, in combination with other land allocations and standards and guidelines, is to maintain a functional late-successional and old-growth forest ecosystem as habitat for late-successional and old-growth related species. Proposed actions should be designed to contribute to attainment of the Aquatic Conservation Strategy objectives and be consistent with Late Successional Reserve Standards and Guidelines. A Forest-wide LSR Assessment has been completed (USDA 2001).

Administratively Withdrawn Areas: These are areas allocated under the 1990 Forest Plan which emphasize recreation, scenery, wildlife, or other resources and do not include programmed timber harvest**.** Upper and Lower Falls Lakes are in the to Semi-Primitive Non-motorized Dispersed Recreation allocation.

Riparian Reserves: This allocation includes areas along all streams, wetlands, ponds, lakes and unstable or potentially unstable areas. Riparian Reserves overlay all other management areas, and the Riparian Reserve standards and guidelines apply wherever Riparian Reserves occur (including Late-Successional Reserves).

Matrix: This allocation occurs along the western edge of National Forest System lands in the Illabot Creek watershed. Most timber harvest and other silvicultural activities occur in matrix land allocations.

Relevant Forest Plan Standards and Guidelines

Standards and Guidelines in the Mount Baker-Snoqualmie National Forest Plan, as amended, that are applicable to the proposed action are found in Appendix A. The consistency of the proposed action and alternatives to it with Forest Plan Standards and Guidelines is assessed in Chapter 3 of this EA.

Roads Analysis

The Mount Baker-Snoqualmie National Forest Roads Analysis (USDA 2003) identified the large difference in road maintenance needs and funding available for road maintenance. Due to insufficient road maintenance funds, the analysis determined that

road closures would be needed to create a road system that could be adequately maintained.

The analysis considered Road 16 from its junction with SR 530 to the Slide Lake trailhead as one road segment. Road 16 was identified as having a high need due to the access that it provides to matrix land allocations, some opportunity for precommercial thinning, and for recreation access. Moderate concerns for impacts to wildlife and fisheries were attached to this road.

Other Relevant Laws and Directon

Endangered Species Act and Sensitive Species

The Forest Service must comply with all terms of the Endangered Species Act and ensure that viable populations of sensitive species be maintained and do not become threatened or endangered as a result of Forest Service actions.

Clean Water Act

Section 313 of the Clean Water Act requires federal agencies to comply with all federal, state, inter-state, and local requirements, administrative authorities, and processes and sanctions, with respect to control and abatement of water pollution. Executive Order 12088 also requires the Forest Service to meet the requirements of the Clean Water Act. All federal and state laws and regulations applicable to water quality will apply in any implementation of the proposed project.

Washington State water quality standards are found in *Water Quality Standards for Surface Waters of the State of Washington*, Chapter 173-201A WAC, pursuant to the provisions of Chapter 90.48 RCW.

Wilderness Act

The Forest Service must comply with the Wilderness Act of 1964. This legislation requires the agency to preserve and protect wilderness character so that the area remains affected primarily by the forces of nature and has outstanding opportunities for solitude or primitive recreation.

Forest Service Roads Policy

This policy, established in 2001, directs national forests to have road networks that are safe, environmentally sound, responsive to public needs, and affordable to manage.

Decision to be Made

The responsible official for this project is the Mt. Baker District Ranger. Considering the purpose and need for the project and the environmental effects of each alternative, the District Ranger will decide:

- whether to implement road management activities as described in the proposed action, an alternative to the proposed action, or to take no action at this time;

- what mitigation measures would be implemented to reduce undesirable environmental effects if an action alternative is selected; and
- any actions that would be taken to monitor project implementation or mitigation measure effectiveness.

The District Ranger will document his decision through a Decision Notice and a Finding of No Significant Impact. He will document his rationale for selecting an alternative and will establish findings required by law. The Decision Notice will address consistency with the Forest Plan as amended.

Tribal Consultation

The Forest consulted with the Lummi, Nooksack, Samish, Sauk-Suiattle, Swinomish, and Upper Skagit Tribes on August 19, 2010. The Tulalip, Sauk-Suiattle, and Swinomish Tribes provided input on the proposed action.

All Tribes that provided input indicated that Tribal members have cultural ties to the Illabot Creek Watershed and use the Illabot Road to access areas for hunting, fishing, religious activities and/or gathering. All also expressed a preference to retain road access by upgrading the road to reduce negative impacts to fish and water quality.

The Sauk-Suiattle and Swinomish Tribes requested additional consultation. The District Ranger left numerous voice mail messages and sent several emails to schedule further consultation regarding this project. To date there have been no response from the Sauk-Suiattle Tribe to schedule the requested consultation.

The District Ranger toured the Illabot watershed with a member of the Swinomish Tribe on July 20, 2011 to discuss Tribal uses and importance of the area to Tribal members.

Public Involvement

The Ranger District emailed a scoping letter to 24 local organizations, state agencies and individuals on August 30, 2010. The District also sent scoping letters to an additional 104 local organizations, state agencies and individuals via U.S. Postal Service.

Scoping information has been posted on the Mount Baker-Snoqualmie National Forest web site since August 30, 2010. Public notification and a request for comments were published in the September 7, 2010 edition of the Courier Times, a Sedro-Woolley, Washington newspaper. Scoping information was also posted at the Slide Lake trailhead during the summers of 2010 and 2011.

Articles regarding the project were also published in the Concrete Herald, a monthly newspaper in Concrete, Washington in November and December, 2010.

These efforts to solicit public input to aid in the identification of significant issues resulted in 103 responses. The method by which these responses were analyzed, used to

define the scope and intensity of the analysis, and responses to these comments is found in Appendix B of the September version of the EA.

An EA and two appendices were provided to the 103 Tribes, individuals, and organizations that responded to Tribal consultation and public scoping**.** These documents were also posted to the Mount Baker-Snoqualmie National Forest website. In addition, an invitation to comment on the EA was published in the Skagit Valley Herald on September 30, 2011. Fifty four comments to the EA were received. These comments resulted in minor edits and clarifications to portions of the EA and a new Appendix B to the EA where the comments are addressed.

Significant Issues

After reviewing the scoping responses and consulting with the Interdisciplinary Team, the District Ranger decided that the following issues were significant to understand and compare the trade-offs for the decision that he would make.

Reducing the miles of the Illabot Road available for motor vehicles would reduce recreation activities, especially for the following activities or people:

- Easy day hikes for children and elderly,
- High lake fishing,
- Use and enjoyment of wilderness

This issue will be measured by:

a. Number of easy day hikes
b. Change in miles of hiking to reach high lakes
c. Change miles of hiking to reach designated wilderness
d. Number of sites in North Lakes area of Glacier Peak Wilderness exceeding limits of acceptable change

Reducing the miles of the Illabot Road available for motor vehicles would contribute to a steady reduction (cumulative) of roads open to the public and overcrowding at recreation sites that retain motorized access.

This issue will be measured by:

a. Miles of open road on District
b. Number of trails on District affected by road closures

Past and current road maintenance budgets have been insufficient to maintain roads to standard. This has resulted in a growing backlog of deferred maintenance that has resulted in poor road conditions, reduced road safety, more frequent temporary road closures due to flood damage, and adverse impacts to water quality and fish habitat.

This issue will be measured by:

a. Annual road maintenance cost based on recent maintenance levels
b. Annual cost to maintain Road 16 to standard

Funding for road improvements is limited. The cost of implementing road improvements to retain vehicle access or decommissioning to reduce impacts to water quality and fish habitat can be used in a variety of locations. Funding expended on Road 16 to provide recreation access may limit road maintenance and improvements on other District roads that have higher recreational use or more diverse land uses. Many public comments suggested that road decommissioning is expensive and requested an economic analysis.

This issue will be measured by:

a. Estimated cost of implementing each alternative.

The Illabot road increases the risk of reduced fish habitat quality resulting from landslides and road runoff. Fine sediment produced by the Illabot road can reduce fish reproduction as well as reducing pool habitat quality that is important as resting and rearing habitat.

This issue will be measured by:
The expected change to aquatic habitat indicators in Illabot Creek. Some treatments such as decommissioning can virtually eliminate risk of road related failure in the long term and some treatments such as upgrading can reduce risk through proper culvert sizing and road drainage. Road failure rate and sediment volume are impossible to predict making changes in aquatic habitat impossible to predict. However, it is possible to provide a description of the change in aquatic habitat quality that is a likely result of road management in the watershed.

Table 1. Selected Aquatic Habitat Indicators

Issue description	Indicator	Measure
Fish habitat quality – Adult migration and maturation	Change in Residual Pool Depth	Mean depth in feet for reach
Fish Habitat quality – Juvenile rearing habitat	Change in Pool area (percent)	Percent Surface area for reach
Fish Habitat quality – Spawning success	Change in fine sediment	Percent <2mm for reach

Project Record

This EA incorporates by reference the Project Record (40 CFR 1502.21) documenting this NEPA process. The Project Record contains Specialist Reports and other technical documentation used to support the analysis and conclusions in this EA. Among other relevant items, the project record also contains Interdisciplinary Team (IDT) meeting notes, scoping documents and responses, and cited literature.

CHAPTER 2 ALTERNATIVES

Alternatives

This chapter describes and compares the alternatives considered for the Illabot Road project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Considering resource impacts identified by the IDT and public comments, the District Ranger identified five alternatives to be considered in this analysis.

Several alternatives were received during public scoping. Alternative M was added as a result of public input. Other alternatives that were suggested, but not included for detailed analyses, are discussed and the end of this chapter.

Alternatives

Alternative N (No Action)

Maintain the Illabot Road as a level 3 road maintenance objective up to the emergency closure beyond the Slide Lake Trailhead. The level of road maintenance preformed for the foreseeable future will be determined by annual budgets, but is expected to be limited to spot grading, slide removal, removing fallen trees, ditch cleaning, and brushing every three to five years.

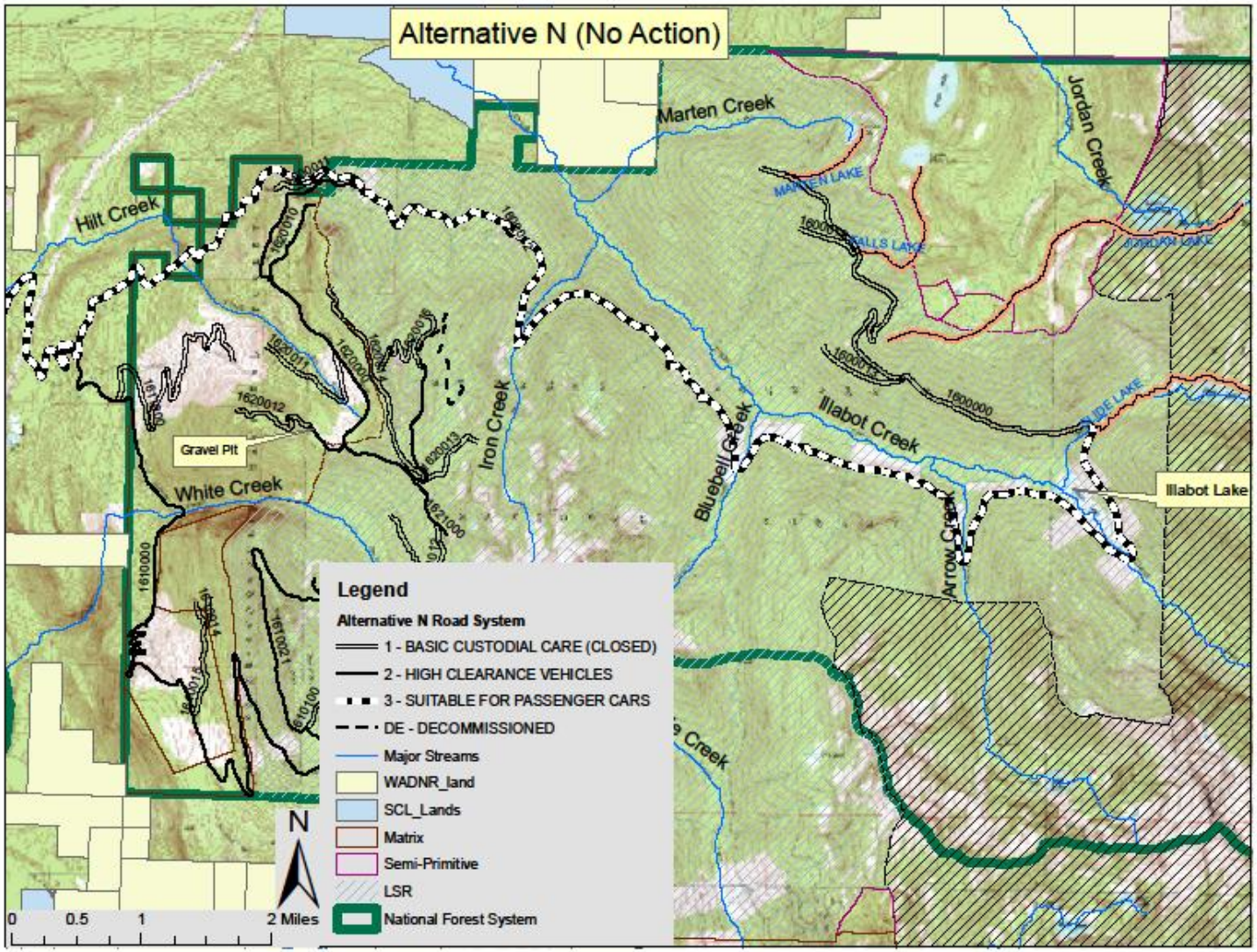
Alternative P (Proposed Action)

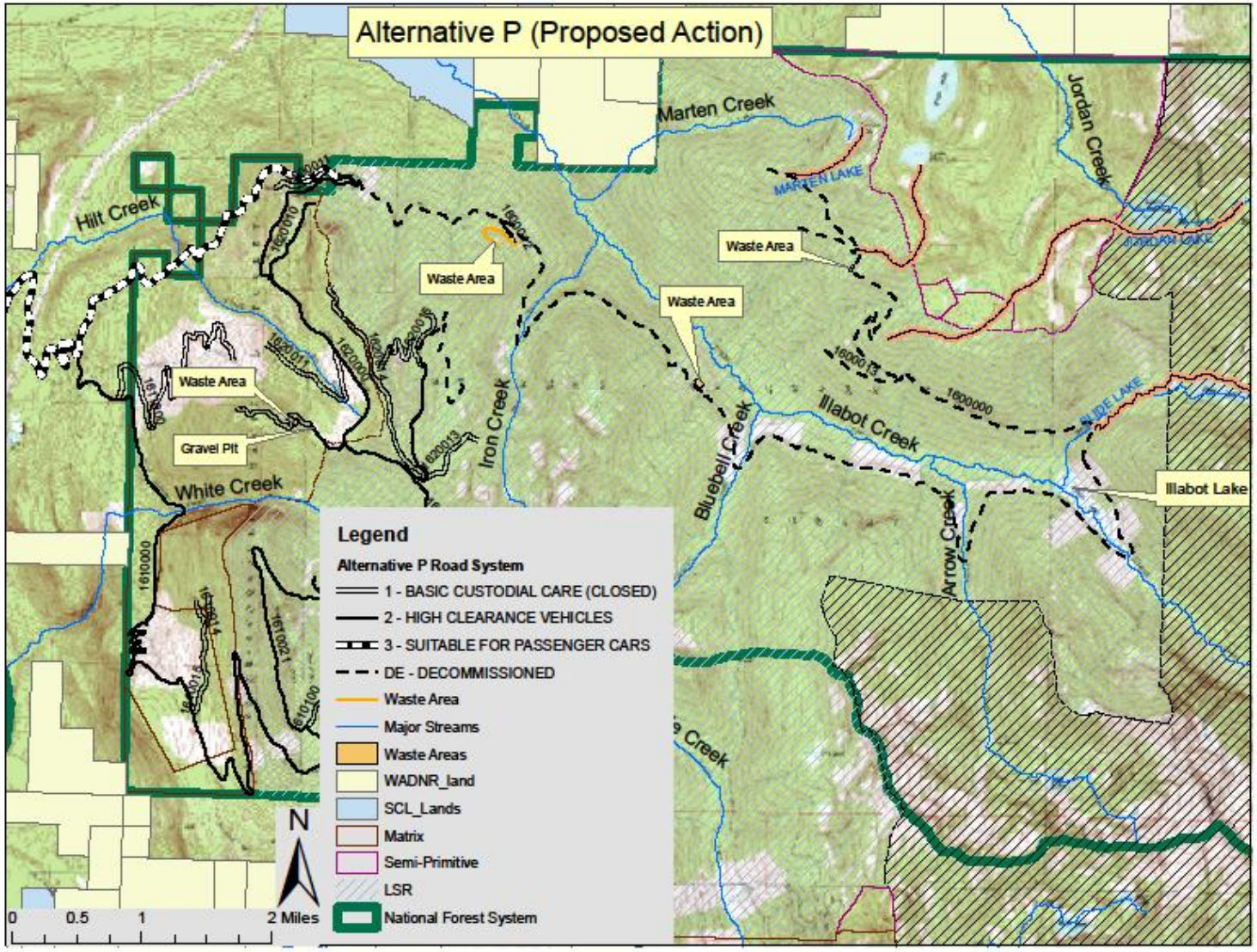
Decommission 16.07 miles of the Illabot Creek Road (Road 16) from mile post 9.5 (its junction with Road 1620) to 25.57 (road terminus). Spur roads 1600.013 and 1600.019 will also be decommissioned. Road decommissioning will consist of culvert removal and replacement with rocked rolling dips. Road fill slope will be stabilized by removing sidecast material and recontouring the road prism. Excess side cast material and concrete from vented fords will be stored on the road bed or hauled to designated locations on spur roads or the rock pit on road 1620.012. Stored fill would be compacted and shaped to allow drainage.

Remove the steel bridge crossing Otter Creek for use elsewhere. Create an overflow channel on the north side of the Illabot Creek Bridge by removing road fill approach.

Culverts will be replaced and additional culerts will be added on Road 16 between MP 8 (National Forest boudary) and 9.5 (its juction with Road 1620), Road 1620 between mile posts 0 and 3.0 (junction with Road 1620.012), and 1620.012 between mile post 0 and the rock quarry.

The Slide Lake trail and trailhead will be abandoned and removed from the Trail System Inventory. The Jordan, Marten, and Falls Lakes trails will also be removed from the Inventory. .


Alternative N (No Action)
Marten Creek
Jordan Creek
Hilt Creek
Iron Creek
Bluebell Creek
Illabot Creek
Arrow Creek
Gravel Pit
White Creek
Illabot Lake
Legend
Alternative N Road System
1 - BASIC CUSTODIAL CARE (CLOSED)
2 - HIGH CLEARANCE VEHICLES
3 - SUITABLE FOR PASSENGER CARS
DE - DECOMMISSIONED
Major Streams
WADNR_land
SCL_Lands
Matrix
Semi-Primitive
LSR
National Forest System
N
0
0.5
1
2 Miles


Alternative P (Proposed Action)
Marten Creek
Jordan Creek
MARTEN LAKE
JORDAN LAKE
Hilt Creek
Waste Area
Waste Area
Waste Area
Waste Area
Gravel Pit
Iron Creek
Bluebell Creek
Illabot Creek
SLIDE LAKE
Illabot Lake
Arrow Creek
White Creek
1600000
1610000
1620000
1620010
1620011
1620012
1620013
1610014
1610021
1610100
Legend
Alternative P Road System
1 - BASIC CUSTODIAL CARE (CLOSED)
2 - HIGH CLEARANCE VEHICLES
3 - SUITABLE FOR PASSENGER CARS
DE - DECOMMISSIONED
Waste Area
Major Streams
Waste Areas
WADNR_land
SCL_Lands
Matrix
Semi-Primitive
LSR
National Forest System
N
0
0.5
1
2 Miles

Alternative U (Upgrade)

Maintain road access to the Slide Lake Trailhead for passenger cars and reduce the risk of road failure where failure risk is highest. This alternative would involve installing rock gabion baskets or similar structures to stabilize slumping road shoulders, increasing the number and size of drainage structures, and converting the culvert crossing of Arrow Creek to a bridge. Culverts will be replaced and addional culverts will be added on Road 16 between MP 8 (National Forest boudary) and 20.25 (Slide Lake Trailhead), Road 1620 between mile posts 0 and 3.0 (junction with Road 1620.012), and 1620.012 between mile post 0 and the rock quarry.

Decommission 5.32 miles of the Illabot Creek Road (Road 16) from mile post 20.25 (Slide Lake Trailhead) to 25.57 (location where bridge was pulled approximately 0.6 miles from the road terminus) and spur roads 1600.013 and 1600.019 as described in Alternative P.

Alternative R (Reduce)

Decommission the last 11.47 miles of Road 16 (from MP 25.57 back to MP 14.1 approximately 1 mile west of Bluebell Creek) and spur roads 1600.013 and 1600.019. Decommissioning would ouccur as described in Alternative P.

Remove the steel bridge crossing Otter Creek for use elsewhere. Create an overflow channel on the north side of the Illabot Creek Bridge by removing road fill apporach.

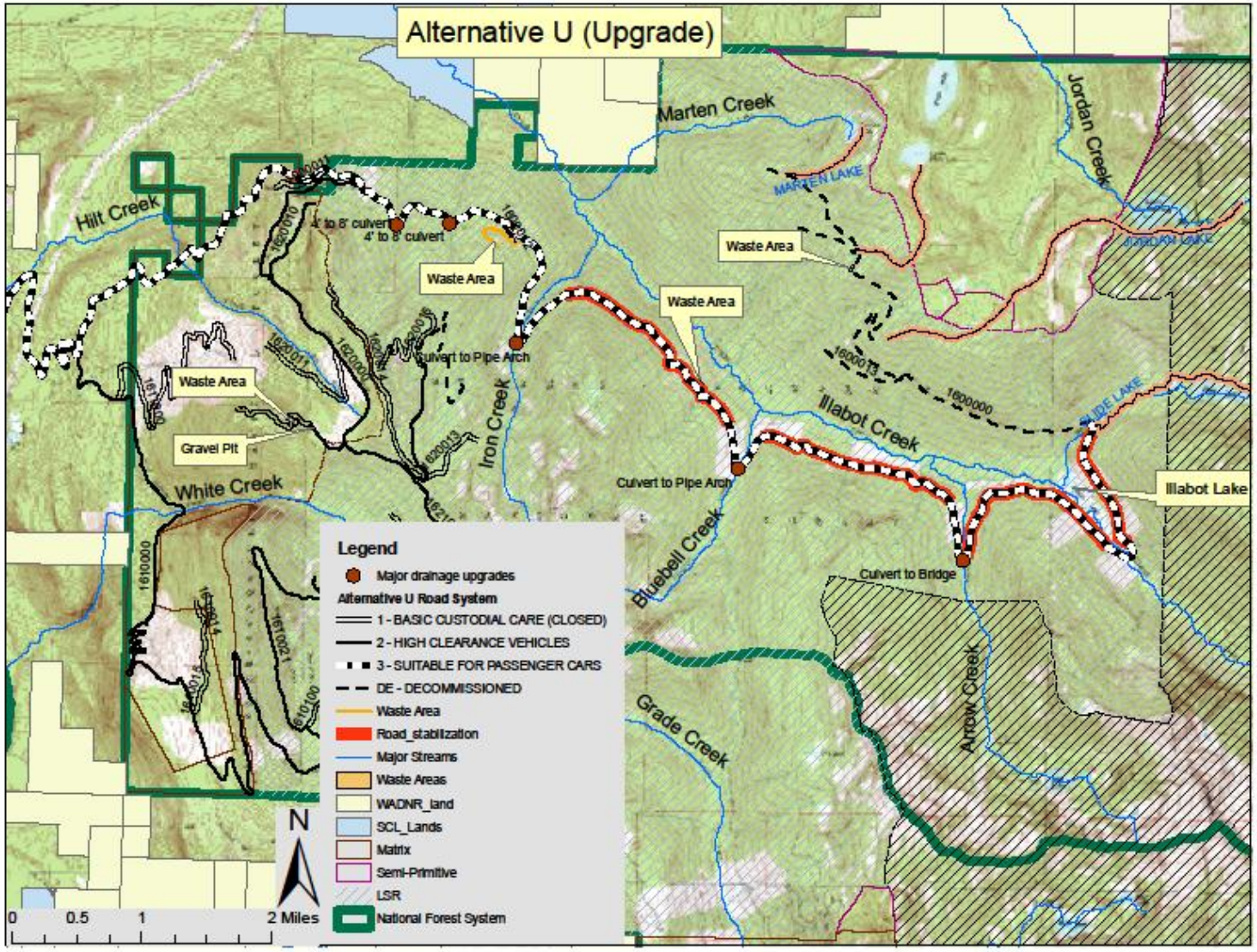
Maintain road access suitable for passenger cars and reduced the risk of road failure risk on Road 16 from the National Forest boundary to MP 14.1, on Road 1620, and 1620.012 as described in Alternative U.

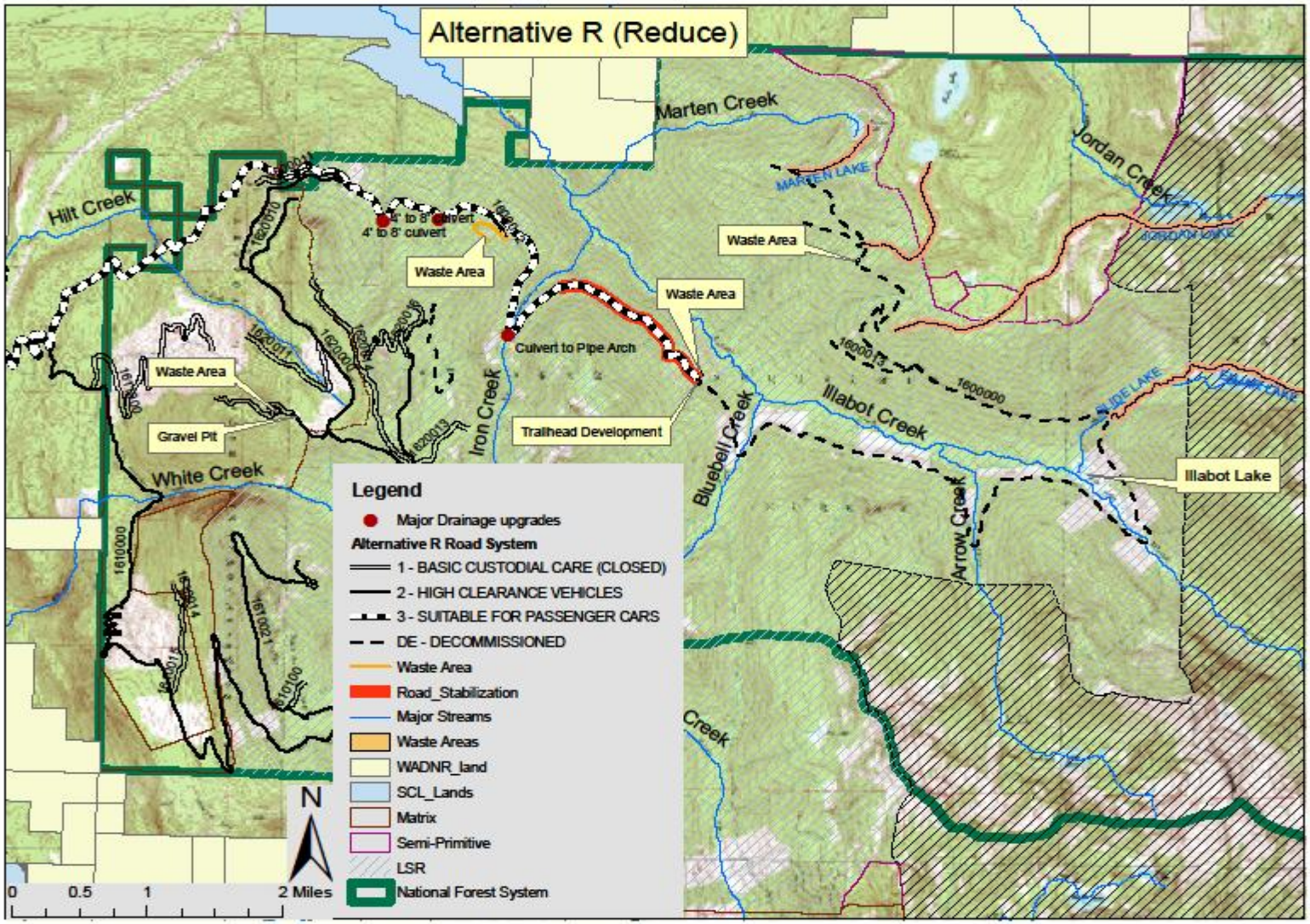
Convert approximately five miles of the road to the Slide Lake Trail, which would require placing trail bridges over several drainages after culverts are removed. Bicycle use would be allowed on the new section of trail, but not from the decommissioned road to Slide Lake. Develop a trail head at the new road terminus. The new trailhead would involve clearing less than one acre of second-growth forest and placing rock surfacing in the parking area.

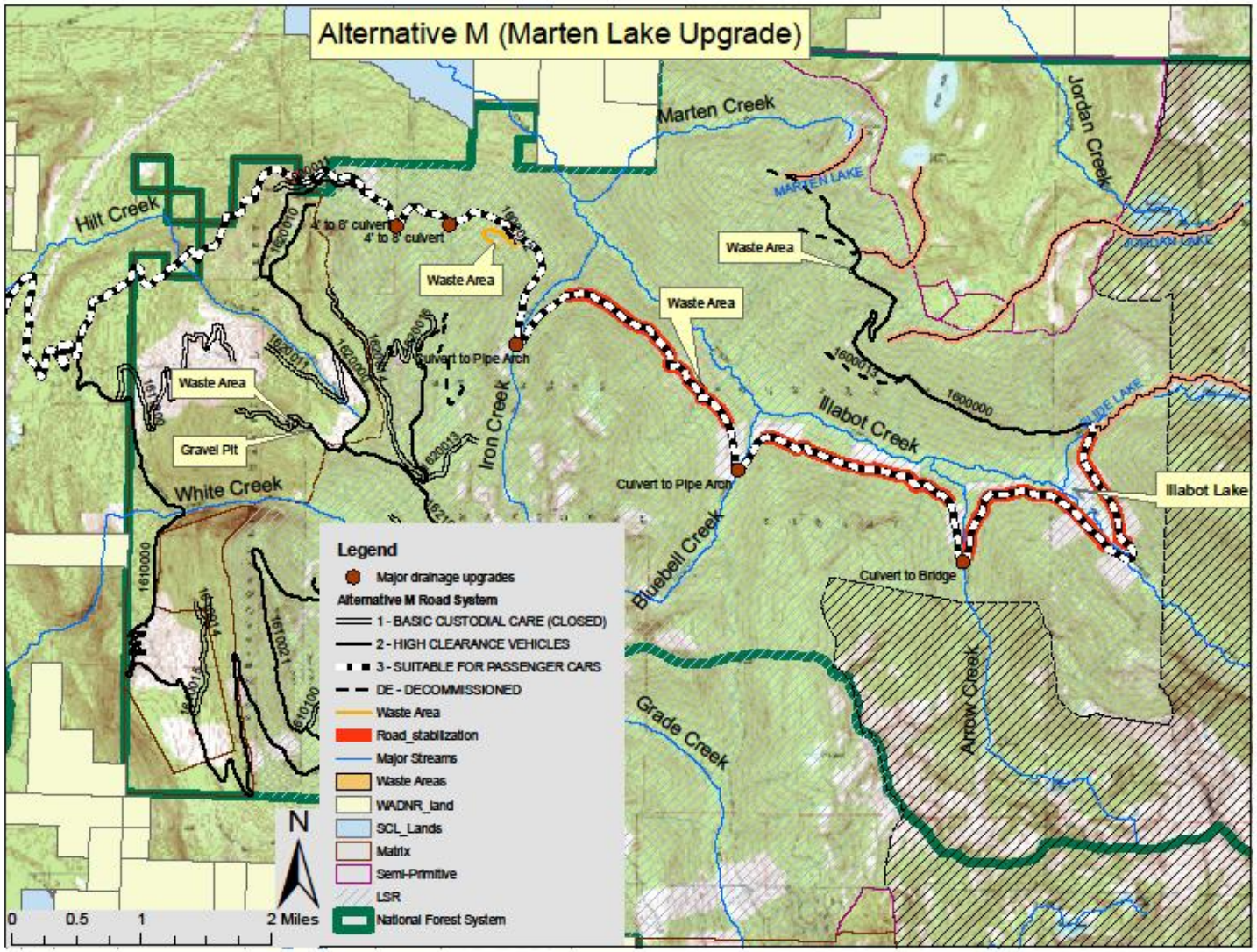
Alternative M (Marten Lake Upgrade)

Maintain road access to the Slide Lake Trailhead, Road 1620, and 1620.012 as described in Alternative U. From the trailhead to Mile Post 25 (the northern half of section 8 near Marten and Falls Lakes), Road 16 would be maintained for high-clearance vehicles only. This alternative would involve installing rock gabion baskets or similar structures to stabilize slumping road shoulders, increasing the number and size of drainage structures, and converting the culvert crossing of Arrow Creek to a bridge.

Decommission spur roads 1600.013 and 1600.019, and Road 16 from MP 25 to 25.57 as described in Alternative P.


Alternative U (Upgrade)
Marten Creek
Jordan Creek
MARTEN LAKE
JORDAN LAKE
Hilt Creek
4' to 8' culvert
4' to 8' culvert
Waste Area
Waste Area
Waste Area
Culvert to Pipe Arch
Iron Creek
Waste Area
Gravel Pit
White Creek
Illabot Creek
Culvert to Pipe Arch
Illabot Lake
Bluebell Creek
Culvert to Bridge
Grade Creek
Arrow Creek
Legend
Major drainage upgrades
Alternative U Road System
1 - BASIC CUSTODIAL CARE (CLOSED)
2 - HIGH CLEARANCE VEHICLES
3 - SUITABLE FOR PASSENGER CARS
DE - DECOMMISSIONED
Waste Area
Road_stabilization
Major Streams
Waste Areas
WADNR_land
SCL_Lands
Matrix
Semi-Primitive
LSR
National Forest System
N
0
0.5
1
2 Miles


Alternative R (Reduce)
Marten Creek
Jordan Creek
Hilt Creek
Waste Area
Culvert to Pipe Arch
Trailhead Development
Gravel Pit
Iron Creek
Bluebell Creek
Illabot Creek
Arrow Creek
White Creek
Illabot Lake
Legend
Major Drainage upgrades
Alternative R Road System
1 - BASIC CUSTODIAL CARE (CLOSED)
2 - HIGH CLEARANCE VEHICLES
3 - SUITABLE FOR PASSENGER CARS
DE - DECOMMISSIONED
Waste Area
Road_Stabilization
Major Streams
Waste Areas
WADNR_land
SCL_Lands
Matrix
Semi-Primitive
LSR
National Forest System
N
0
0.5
1
2 Miles


Alternative M (Marten Lake Upgrade)
Marten Creek
Jordan Creek
MARTEN LAKE
JORDAN LAKE
Hilt Creek
4' to 8' culvert
4' to 8' culvert
Waste Area
Waste Area
Waste Area
Culvert to Pipe Arch
Waste Area
Gravel Pit
Iron Creek
Illabot Creek
BLUE LAKE
Culvert to Pipe Arch
Illabot Lake
White Creek
Bluebell Creek
Culvert to Bridge
Arrow Creek
Grade Creek
Legend
Major drainage upgrades
Alternative M Road System
1 - BASIC CUSTODIAL CARE (CLOSED)
2 - HIGH CLEARANCE VEHICLES
3 - SUITABLE FOR PASSENGER CARS
DE - DECOMMISSIONED
Waste Area
Road_stabilization
Major Streams
Waste Areas
WADNR_land
SCL_Lands
Matrix
Semi-Primitive
LSR
National Forest System
N
0
0.5
1
2 Miles

Project Design Features and Mitigation Measures

All Action Alternatives (P, U, R, and M)

- If a previously unidentified cultural or historic resource, Indian human remains, or specified cultural items identified in the Native American Graves Protection and Repatriation Act is discovered during implementation, the project shall be stopped in the area of the find, and the Forest Heritage Specialist shall be notified.
- All excess road fill will be stored at locations shown on alternative maps.
- All gravel used for construction and road surfacing will be obtained from the rock quarry on road 1612.012.
- Best Management Practices for all Road building site construction practices, including upgrading, decommissioning road and maintenance would be used from the following sources (FP-03) - Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects and (FSSS) - Forest Service Supplemental Specifications to FP-03.
- To prevent the introduction of new invasive plants and the spread of existing infestations:
    - All heavy equipment that will operate outside the limits of the road prisms must be cleaned prior to entering National Forest system lands.
    - Only State certified weed-free straw or mulch may be used
    - Use only gravel, fill, sand, and rock this is judged to be weed free by District or Forest weed specialists.
    - When pulling in vegetation from the road shoulders no seeding or other revegetation is necessary. Do not pull in vegetation from the road shoulder in those areas with documented noxious weeds.
    - All equipment and gear should be cleaned before leaving areas known to have noxious weeds.

Alternative P

- Because decommissioning of the road would seriously hamper efforts to treat and monitor the invasive plant infestations, treatment of the weeds should be a part of the road contract, unless they are successfully treated beforehand. The weed infestations will be treated as follows:
    - Orange and meadow hawkweed – spray with a Forest-approved herbicide
    - Butterfly bush – cut all stems and apply Forest-approved herbicide to the stumps
    - Herb robert – hand pull, place plants in bags and seal carefully. Remove to a landfill.
- The decommissioned roads will be monitored annually for 3 years to check on noxious weeds and native plant regeneration. Treatment will continue annually, if funds are adequate, until the weeds are eradicated. If the noxious weeds appear to be eradicated 3 years post-treatment, monitoring will decrease to once every 3 years.

Native plant regeneration and growth will be documented along with the noxious weeds. If native plant regeneration is not adequate after 5 years, a new restoration plan will be prepared and implemented.

Alternative R

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Alternatives Considered, but not Analyzed in Detail

Volunteer Road Maintenace

Six comments were received suggesting that the road be maintained by volunteers. Although volunteer road maintenance has been done on some national forests, it is unlikely to be successful in the long-term maintenance of this type of road and its location. There would need to be a long-term agreement in place with an organization that had the ability to post bonding and carry insurance. In addition, the organization would be required to have past experience in road maintenance and the equipment capable of doing the job. At present there is no indication that such an organization exists. Even with volunteers providing the equipment and personnel, the Forest Service would still be required to expend time and salary (estimated to be $1500 to $3500 annually) to put together, manage and oversee the agreement. It is unlikely that a volunteer organization would be capable of conducting major repairs that frequently occur on the Illabot Road. To maintain Road 16 to standard would cost over $20,000 per year and that level of maintenance investment cannot be guaranteed or expected on a long term basis. Given the lack of an organization qualified to conduct maintenance, this alternative appears infesible.

Allowing Only Seasonal Access with a Gate

Gating a road does not reduce annual maintenance costs. Even if a road is only driven part of the year it still requires blading, brushing, and other maintenance tasks. Furthermore gates increase maintenance costs as a result of vandalism. The gate

previously located at MP 22 along this road was vandalized to the point that it is no longer functional. Because a gate would not meet the need to reduce road maintenance costs, it was not considered a viable alternative.

Reduce Maintenance Costs by Reducing the Maintenance Level

Reducing the ML from a 3 to a 2 from MP 8.0 to MP 20.5 would save maintenance funds annually, but would also limit access to those with vehicles capable of driving on a rougher road. In addition, reducing the ML would also lessen the chance that maintenance would occur. A ML 3 road is prioritized for maintenance before an ML 2 road. A good example of this is the portion of the Illabot Road from MP 20.5 to MP 25. It is a ML 2 and has numerous safety and road failures that need addressing before this ML 2 road can be reopened for traffic. Due to the location of the Illabot Road on a north slope with lots of surface and subsurface water in the road prism, the road would continue to suffer and failures would occur more frequently than they do now if it were in ML 2 status and the road would likely be closed for long periods of time. Reducing the maintenance level would not meet the need of reducing the risk of road failure to avoid degrading water quality and fish habitat.

Provide trail access via Private Roads North of Illabot Creek

The project was originally conceived with the intent of obtaining a road easement or road use agreement on private land to a point roughly one mile northwest of Marten Lake. From that point, a trail would be constructed that would have access many of the recreation sites that are currently accessed by the Illabot Creek Road. Multiple inquires with the land owner indicated that they had no interest in granting either an easement or a road use agreement. Unless a road easement or agreement is obtained it is infeasible to include this item in any alternative.

Develop a trail to Illabot Peak and/or implement repairs and improvements to nearby trails to compensate for reduced recreation use.

Additional trails or improvements to other trails does not meet the need to reduce road maintenance costs or reduce the risk of road failures. In addition, there are inadequate funds to maintain the current trail system. Adding additional trail miles or making improvements to trails that will not be maintained would not sustain alternative recreation sites and would be ineffective.

Use funds from hiker donations or require Northwest Forest pass at the Slide Lake Trailhead to fund road maintenance.

Although donations are accepted, it is unlikely that donations of more than $20,000 each year would be made that would allow the road to be maintained to the extent that it would reduce the risk of road failure. As a result this alternative would not address the project need.

Under the Federal Lands Recreation Enhancement Act, a recreation fee may be required only at an area that provides significant opportunities for outdoor recreation; that has substantial Federal investments; where fees can be efficiently collected; and contains all of the following amenities – designated developed parking, permanent toilet facility, permanent trash receptacle, interpretive sign or exhibit or kiosk, picnic tables, and

security services. Slide Lake Trailhead does not contain these amenities so no recreation fee can be required. It is not practical to implement this alternative.

Use funds from timber harvest to maintain Road 16

Because the area beyond MP 9.5 is allocated to LSR or other land allocations that restrict timber harvest, there would not be sufficient funds generated from timber harvest to perform the needed road maintenance to meet the needs for this project. This particular LSR is at its desired habitat condition and is lowest priority for timber sales to improve habitat condition.

CHAPTER 3 AFFECTED ENVIRONMENT

Introduction

This chapter provides the basis for analyzing the effects of the proposed action described in Chapter 1. A description of the existing environment is provided for each resource. The effects are described in more detail in the Heritage, Botany, Fisheries, Engineering, Hydrology, Fire Recreation, and Wildlife Specialist Reports in the Project Record.

Roads

Road History

The Illabot road system construction first began around the early 1930's as Gorge and Diablo Dam transmission lines were installed on the lower part of the Illabot road area which included the harvesting of private timber lands. By the 1950's Road 16 had been constructed to the National Forest boundary. In 1960 the Forest Service began new road construction at Mile Post (MP) 8.0 and eastward toward Otter Creek. In 1966 the road was extended further eastward past Otter Creek to MP 23.2. In 1986 Road 16 was extended to MP 25.7 with the Upper Slope timber sale. Side spurs 1600013 and 1600019 were also constructed during this time. This was the last timber sale on Road 16 from the Forest boundary to its terminus.

Road 1620 construction began in 1967.

In 1973 the Hilt Skyline timber sale reconstructed by widening Road 16 from MP 6.0 to MP 9.5 and in 1978 Road 16 was improved by widening from MP 11.3 to MP 22.9.

There have been about 44 miles of roads identified on private, state, and federal timber lands in the Illabot watershed that have road failure risks. Over 31 miles of these roads have has some level of road treatment projects. In 1995, the United States Forest Service (USFS) replaced culverts on 23.9 miles of Forest Road 16, 11.1 miles of which fall within the Illabot watershed. Two spur roads were also treated at that time. Road 1600012 was upgraded along 0.2 miles and 0.6 miles was decommissioned (removed culverts and installed water-bars or rocked dips). In 1999, the USFS completed an additional treatment on Road 16 that included 3.2 mi of upgrade and 2.9 mi of storage

(installed backup waterbars or rocked dips) that closed the road beyond the trail to Jordan Lakes. The USFS also treated Road 1620 in 1999, upgrading 0.4 mi and storing 2.4 mi of road within the Illabot watershed. In total, the USFS has treated 20.7 miles of road within the Illabot watershed: upgrade = 14.8 mi, storage = 5.3 mi, decommission = 0.6 mi. Approximately 3.8 mi of road on USFS ownership have received no treatment.

The drainage improvements on Roads 16 and 1620 in 1995 and 1999 did not address all drainage problems and many remain untreated. Remaining deficiencies include: badly corroded smaller culverts (18"-24"), separated culverts (pulled apart at the joint connection) and need for larger culverts to properly handle the runoff or drainages. Large crossings such as Iron Creek is severely undersized, while Bluebell, Arrow and No Name Creeks were not addressed in earlier drainage improvements.

In 2005, Seattle City Light (SCL) decommissioned approximately 18.7 miles of forest road on SCL-owned property, approximately 13 miles of which fall within the Illabot and O'Brien watersheds). An additional 3 roads totaling 2.2 miles within SCL ownership on the Illabot alluvial fan have been blocked to vehicle access. Approximately 1 mi of road that is shared with Cascade Timberlands remains untreated on SCL property.

In 2010 the road past Otter Creek and the Slide Creek Trailhead was closed to all vehicle traffic due deteriorating road conditions that made some sections of this road unsafe for public travel. The Forest Service had not been maintaining this section of road for more than 10 years due to declining budgets and road conditions digressed over time creating unsafe conditions along this segment. The section of Road 16 from MP 8.0 to MP 20.5 received a large amount of work in 2010 to repair narrow sections, reconstruct ditches, repair shoulder slumping and surface repair. The cost for the maintenance work was $35,000 and an additional $55,000 was expended to repair flood damage that had closed the road for more than one year.

Road Condition

Road 16 from MP 8.0 (National Forest boundary) to 9.5 (junction with Road 1620)

This section of ML 3 road is constructed through a wet section of the north-facing side slope. The road is experiencing failing culverts, wet subgrades that need other design alternatives and some shoulder failures. An ERFO site was repaired at MP 8.8 where a slope failure from above the road sent debris and sediment down and washed out the road. Repairs were made in 2010. Side slopes average 50% through most of the area.

Road 16 from MP 9.5 to 14.1 (approximately 1 mile west of Bluebell Creek)

Side slopes on this ML 3 road are variable with roughly 1/3 of the distance having side slopes of 70% to 100%. The road prism is susceptible to shoulder failures causing narrower road sections. A gabion basket was installed in 2010 to gain back lost road width at MP 10.2. A rock face begins at Iron creek and continues through to MP 14.1 limiting the ability to shift the road inward without incurring great expense. Most culverts are failing and at their lifespan expectancy. Shoulder failures are common the last 2 miles of this section. Two log retaining walls appear to be aging and may need

attention to remain functional. At the Iron Creek crossing an undersized culvert has created a large scour pool and downstream scour on one of the larger tributaries.

Road 16 from MP 14.1 to 20.5 (Slide Lake Trailhead)

A rock face continues on the inside of this ML 3 road throughout the majority of this section. Steep side slopes occur and narrow road sections are present where shoulder failures are occurring that require periodic repairs. Most culverts are failing and at their lifespan expectancy. Side slopes range mostly from 50% to up to 100%. At MP 15.35 is a particularly narrow section of road as a result of active down slope slides. Repairs to this site will need to be made soon to retain vehicle access, but may not be possible due to a lack of a stable substrate. Log retaining walls are also located within this section may need attention to remain functional.

Two drainage structures have interrupted bed-load movement and resulted in channel scour below the road in the channel downstream. These vented fords (culverts with concrete pads) are located at MP 15.745 and MP 17.52. At the first site interruption of bed-load has resulted in the formation of a severe chasm where more than three hundred yards of material has been eroded by the stream channel. At the second site just before Arrow Creek, the bed-load disruption has resulted in the slope below the road eroding away and the only thing keeping the road prism from collapsing is a cedar log that is acting as a partial retaining structure spanning the gully beneath.

Road 16 from MP 20.5 to 25 (end of drivable road)

Most all culverts need replacement in this ML 2 road and there are a few narrow sections with shoulder failures. Ditch lines are beginning to fill. The road bed is littered with rocks and down logs.

Summary

The Illabot Road construction work started at the Forest boundary (MP 8.0) and eastward began in the late 1950's and continued into the 1960's with the materials and technology of that time period. The road was extended past MP 20.0 in the late 1970's and into the late 1980's. Fifty years plus have elapsed since the first culverts were installed and those road drainage features are at, or already have exceeded, their lifespan. Deteriorating culverts seep and leak water causing road slumps and not transporting the water past the road prism to the downhill side of the road.

Road 16 was built as either full bench or cut and fill types of construction. Where the road is constructed as cut/fill sections the road has failing shoulders due to steep side slopes and the inability to properly compact fill (also called sliver fills) on steep side slopes. The side-casted section road shoulders continue to fail resulting in urgently needed repairs over the past few years. Some of those repairs require gabion basket structures to be installed due the extremely steep side slopes. The sections of road that was constructed on full bench sections are still in good condition with no shoulder failures.

Recreation

The Illabot Road 16 provides access for several recreation activities, but they generally start at the trails. There are four trails that start on Road 16 with Slide Lake Trail being the most used because it affords a short hike to the lake and the Glacier Peak Wilderness.

The main recreation activities include day hiking, backpacking, camping, fishing, hunting, climbing, and cross-country travel. The attraction to the area appears to be both the easy trail access to Slide Lake and the more challenging cross-country travel to remote and wild places such as the high lakes and mountain peaks. Visitors to this area are varied in experience, outdoor skills, knowledge, and range from beginner hikers and backpackers of all ages, to the most experienced mountaineers and cross-country travelers who can navigate through extremely difficult terrain.

Use data has only been collected from the voluntary registration sheets at the trailhead register box at Slide Lake Trailhead. From this trailhead, Slide Lake is the primary destination for most visitors, though many visitors indicated the purpose of their trip was to access destinations beyond Slide Lake. No trail registration use data has been collected from other trailheads along the Illabot Road. Limited ranger reports from past seasons indicate that these other areas are receiving less total use than that originating from Slide Lake Trailhead.

Hiking

The ability to complete hikes in a day vary by individual, but a hike of 10 miles or less round trip is generally accepted as a day hike. A day hike of six miles or less is considered short and achievable for most hikers including families and the elderly.

Historically the Illabot watershed was accessed by a trail originating on private land approximately 1.5 miles northwest of where Illabot Creek crosses the National Forest boundary. Access to many high lakes originated from roads on private lands to the north in Jordan and Boulder Creeks. As road access to the public was restricted on these roads in the 1990s, most access to these areas shifted to originate from Road 16 on National Forest System Lands.

The Illabot Road is currently closed at the Slide Lake trailhead which prevents vehicle access to the Jordan Lake, Falls Lake and Marten Lake Trailheads. The Illabot Creek Road was closed to vehicle access in 2009 through early summer 2010 due to road damage and was reopened in 2010 only to Slide Lake trailhead.

Slide Lake Trail

The road to the trailhead (Recreation Destination Map) is maintained for passenger vehicles. Parking at the trailhead is adequate for approximately 15 cars. On the north side of Otter Creek Bridge, there are two dispersed campsites located before the current road terminus. There is a trailhead sign board and a trail register, but no toilet.

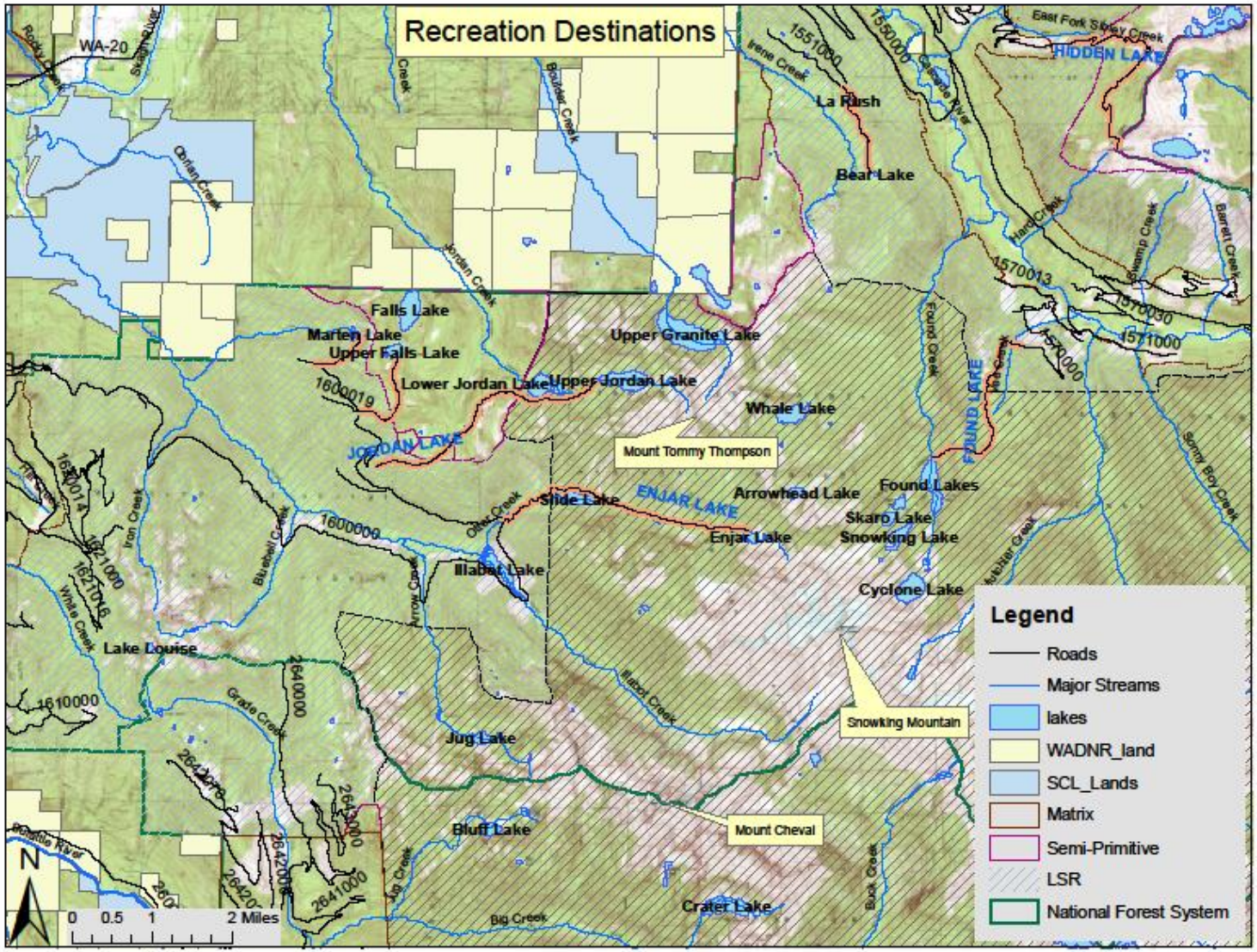
The Slide Lake Trail is identified in the trail inventory as a hiker only; moderate difficulty level trail, primarily due to the narrow tread. Most hikers would consider this an easy trail with an elevation gain of only 300 feet to Slide Lake. It is a maintained trail from the trailhead to the north end of Slide Lake. Maintenance on it has been sporadic over the years, with the main emphasis on logging out blown down trees. The trail is 1.4 miles in length and enters the wilderness at the one mile point. It maintains a gentle grade for its entire length. It is a pleasant easy hike, making the lake accessible to a wide variety of folks that would not normally get to other lakes in the backcountry due to ability, fitness, age, or experience. The trail brings visitors to the west end of the lake. From here it travels through the forest above the north side of the lake shore for approximately 0.5 mile to the east end of the lake and the in-let. This segment of the trail is not maintained and is more difficult to follow, becoming less distinct half way down the lake. It wanders around and across fallen logs, up and down the hill side, in and out of campsites, and across talus slopes and through brush. Tread is visible, and in some places, multiple paths have developed due to hikers going around fallen logs.

The Slide Lake Trail is also used to begin trips to more remote destinations in the area. This includes cross-country travel from Slide Lake to Enjar, Whale, and Arrowhead Lakes, Mt. Tommy Thompson and Snowking Mountain, and less often, access to the Founds Lakes area.

Slide Lake is at 3,100 feet in elevation. Because of this, the lake is one of the earliest mountain lakes to thaw out in the area, usually becoming snow free by early June. Slide Lake receives a diverse range of recreation use and visitors. Activities at Slide Lake include hiking, camping, fishing, hunting, photography, berry and mushroom picking, and swimming. Visitors range from beginners who are experiencing a trail, wilderness, or fishing experience for the first time, to very skilled and knowledgeable outdoors folks. The lake receives use from a range of users seeking easy access lake and wilderness opportunities. This includes all ages (youth through elderly) of visitors, families, organizational groups such as scouts and church groups, and less physically capable people who may not have the ability to hike more difficult trails.

Use data was compiled from trail registers from Slide Lake for 5 years including 2010, 2008, 2007, 2006, and 2004. No use data was available for 2009 due to the road closure. There were other destinations besides Slide Lake identified on the registers and included Enjar Lake, Snowking Mountain and Lake, Whale Lake, Arrowhead Lake, Found Lake, Mount Tommy Thompson, Mt. Chaval, Cyclone Lake, Granite Lakes, Jordan Lakes, and Jug Lakes. Destinations were often identified as a single visit to one location, such as Slide Lake, or as a trip with multiple destinations during the visit such as traveling to Enjar, Whale, and Arrowhead Lakes.

Due to the lack of registers at other locations, it is difficult to get more accurate knowledge of recreation use in the Illabot Creek area. However, the registration data does show that the Slide Lake Trailhead and the areas it accesses are receiving moderate use. Over the five years that registration records were counted, data shows that an average of 116 groups and 332 people registered for the area each year during the snow-free season.


Recreation Destinations
WA-20
Falls Lake
Marten Lake
Upper Falls Lake
Lower Jordan Lake
Upper Jordan Lake
Upper Granite Lake
Whale Lake
Mount Tommy Thompson
JORDAN LAKE
ENJAR LAKE
Slide Lake
Arrowhead Lake
Enjar Lake
Found Lakes
Skarp Lake
Snowking Lake
Cyclone Lake
FOUND LAKE
HIDDEN LAKE
La Rush
Bear Lake
Illabot Lake
Lake Louise
Jug Lake
Bluff Lake
Crater Lake
Mount Cheval
Snowking Mountain
Legend
Roads
Major Streams
lakes
WADNR_land
SCL_Lands
Matrix
Semi-Primitive
LSR
National Forest System
N
0 0.5 1 2 Miles

Limited informal studies at five trails in the Baker Lake Basin found an average of 59% of the visitors actually filled out the registration. Using this correction factor, actual use of the Slide Lake Trail may be closer to an average of 562 people. From the registration data, 64% of the people registering at the Slide Lake Trail were there for day use while overnight use was 36%. The average group size from the Slide Lake Trail registry was 2.8 people.

The percent of overnight use in the Illabot Creek area, in relation to its overall use, is the second highest overnight use on the Mt. Baker Ranger District. Only the Easton and Squak Glacier climbing routes on Mt. Baker is higher at 71% overnight use. There is no overnight use data for the north side climbing routes on Mt. Baker, which could also have higher overnight use than Illabot Creek. Lake Ann has the third highest overnight use at 34% (climber base camp for ascent of Mt. Shuksan), followed by Watson/Anderson Lakes est at 25% overnight use, Elbow Lake at 14%, and Blue Lake at 13%. Watson, Anderson, Elbow, and Blue Lakes are most comparable to Slide Lake in that they offer similar visitor activity and opportunity, such as day hiking, overnight camping, and fishing, in a similar environment.

Trailhead register data indicate that visitors stay in the area longer than other areas on the district, and for extended periods of time, ranging anywhere from two to ten days. The high length of time in this area is probably due to a number of factors. The hiking in the area after leaving the Slide Lake Trail becomes very difficult and route finding can be challenging, taking a lot of time to navigate through brush and over steep slopes for several miles before reaching a destination. This creates the need for visitors to be prepared to either camp before arriving at their destination and/or to stay a few days once they reach it. Many parties travel through the area camping at different destinations every night or every few nights. Others, once at their destination would use it as a base camp, taking day trips to other destinations and returning to the base every night. Another reason for extended stays in this area could be the desirability of the remote wilderness where they can access the high lakes and peaks for fishing, exploring, challenging route finding, and climbing opportunities, or the desire for solitude.

Jordan, Marten, and Falls Lakes Trails

Prior to 2009, the Illabot Road was open to vehicle traffic to the Jordan Lakes Trailhead, at approximately the 23 mile mark. There was parking for a few vehicles, but no trailhead signs. Current access to the Jordan Lakes likely follows the closed road from the Slide Lake trailhead for about 3 miles to the old trailhead. From there, a four mile boot path arrives at the west end of Lower Jordan Lake. The trail inventory identifies this trail as "most difficult" level. Most of the trail is in semi-primitive non-motorized management allocation, entering the wilderness at three miles. For the most part, there is continuous tread visible along the entire length except where the path travels through talus. There is a path around Lower Jordan Lake and a path to Upper Jordan Lake. Limited ranger reports from past seasons indicate that the Jordan Lakes area is receiving similar amounts of overnight use as that originating from Slide Lake trailhead, but little day use.

Marten Lake and the Falls Lakes Trails are accessed beyond the Jordan Lakes Trail, near the end of the Illabot Creek Road (MP 25). There are no trailheads, signboards, toilets or

trail registers on the road at the start of these trails. These trails are user built and maintained. Marten and the two Falls Lakes are not within wilderness, but are within Management Area Semi-Primitive Non-motorized land allocations.

The trails to these lakes are identified in the trail inventory as moderate difficulty level, hiker only, and inadequate. Inadequate indicates that the trails do not meet trail standards and are often too steep with narrow tread, poor location and lack adequate structures. Martin Lake trail is one mile in length and it ascends up the ridge from the road and then drops down into the lake basin at 4,300 feet elevation.. The Falls Lake trail is 1.5 miles in length and from the road it ascends up to the saddle and then traverses north to the Upper Falls Lake basin. Upper Falls Lake is at 4,513 feet elevation, and Falls Lake is at 4,032 feet. Activities at all lakes are fishing and camping. To access these lakes, experience in route finding and cross-country travel is necessary. There are no ranger reports for this area and conditions at these lakes are not known. Sporadic reports received from the public indicate that the lakes receive both day and overnight use, and that all lakes have camps at them. Garbage at the lakes is usually mentioned in visitor reports. There are not use counts for these lakes so it is unknown how many visitors use the area.

Lake Fishing

Slide Lake is the most popular lake for fishing due to its easy access and early thaw. Both day users and overnight campers fish the lake. Enjar Lake is at 4,321 feet elevation and is accessed from Slide Lake on an unmaintained inventory trail. Fishing at this lake would likely require overnight camping. Also accessed from the Slide Lake Trail are Whale Lake (4,555 feet elevation) and Arrowhead Lake (4,406 feet elevation), which are fished by the more experienced and skilled users as there are no trails and the cross-country travel is challenging.

Jordan Lakes (Lower 4,032 feet and Upper 4,510 feet) are currently accessed for fishing by walking the closed road 3 miles and then the trail 3 miles. This could be a day trip by the most skilled but mostly is an overnight trip. Jug Lake at 3,907 feet elevation is accessed off of Road 16 at about MP 17. There is no trail but some user tread. Falls Lake (4,032 feet elevation) and Upper Falls Lake (4,513 feet) are accessed off Road 16 at about MP 24 (4 miles past road closure) and hiking over 1.5 miles of inadequate trail. Marten Lake is located at 4,300 feet elevation and is accessed from Road 16 at about mile 25 (5 miles past road closure) and hiking 1 mile of inadequate trail. Some skill and experience would be needed to access and fish these non wilderness lakes.

Wilderness

The Mt. Baker Ranger District manages 57,500 of the 576,900 acres of the Glacier Peak Wilderness. These acres are located in the Cascade and Illabot Creek drainages and are within an area known as the North Lakes area. Though the entire North Lakes area comprises approximately 128,000 acres, roughly the northwest corner of the wilderness, this report addresses only the area which is generally accessed by the Illabot Road 16.

The Illabot Road provides access to several lakes and peaks in the drainage, including Jug Lake, Mt. Tommy Thompson, Mt. Chaval, King, Slide, Enjar, Arrowhead, and

Whale Lakes, Snowking Mountain, Lower and Upper Jordan Lakes, Falls and Upper Falls Lakes, and Marten Lake. There is only one maintained trail that provides access to Slide Lake. There are several unmaintained trails that lead from different points along the road to various lakes and peaks. In addition, there are user-built paths within the area that connect one lake to another and climbing routes to peaks. These user-built trails are generally more difficult to use and follow as they traverse through steep, brushy, rocky, terrain with navigation hazards such as cliffs and creek crossings, and sections where the route is not visible on the ground. Much of the travel through the Illabot area is done without trail. In these conditions, visitors rely on their skills, knowledge and ability to navigate and hike without a path.

Recreation and wilderness management activities have included maintenance of the Slide Lake Trail, wilderness patrols to educate visitors, campsite clean-up, garbage packing, maintenance of toilets, inventory and monitoring of use impacts at camps and along boot paths, and enforcement of regulations. Regulations for this area include all the National Forest and Wilderness Regulations, and the group size regulation which limits groups of people and animals to 12. Campfires are allowed at all destinations within this area and there are no restrictions on camping.

The goal for Wilderness identified in the LRMP, or Forest Plan, is to preserve and protect the wilderness character, allow for naturalness, and to provide for solitude, challenge and inspiration. Within these constraints, and following a policy of non-degradation management, provide for recreation, scenic, educational, scientific, and historical uses. In the LRMP, wilderness management direction is provided in the Wilderness Recreation Opportunity Spectrum (WROS), which is divided into separate classes or intensities (Transition, Trailed, General Trailless and Dedicated Trailless). Standards and Guidelines have been developed for each class and include Carrying Capacity and Limits of Acceptable Change (LAC). Carrying capacity was developed to estimate the amount of recreation visitor use that a wilderness or portion of wilderness, could support without degradation of resource values. The limits of acceptable change is a system to establish limits on the change that can occur in the wilderness within the no degradation policy, before management action must be taken to reverse trends of change. The system has incorporated limits, or maximum levels, for which key indicator resource values can change before management actions are implemented.

Campsite inventory and monitoring of wilderness areas accessed from the Illabot Road was conducted in 1984, 1985, 1989 and 1991. In the summer of 2010, Slide, Enjar, Arrowhead, and Whale Lakes were visited by wilderness staff, but campsite inventories were not completed, only a field review and write up were performed. When assessing impacts to wilderness resource such as camps, it is important to remember, in particular in the sup-alpine vegetation, that it does not take a lot of use to cause the initial damage. However, once the damage has occurred at the site, the site can handle much more use without incurring additional or more impacts. The following descriptions of routes and conditions reported are for areas where inventory and monitoring was completed with a summary of the resource impacts as they relate to standards and guidelines for wilderness areas.

Slide Lake

An inventory of campsites was completed in 1991. There are six campsites located on the north side of the lake and two on the south side. Inventory and monitoring was done on the 6 north side sites, but not on the two south side ones. The 2010 field review confirms that the 6 campsites on the north side are still being used. The 2 campsites on the south side of the lake were not accessed in 2010 and the condition of these sites is not known. Of the six north side campsites, five are within the forest canopy and near the lake shore, and the sixth one is located past the in-let near Otter Creek.

The 1991 inventory suggests that two of six campsites examined exceed Forest Plan standards for vegetation loss and damage. Rangers over the past 25 years have traditionally reported picking up, collecting and hauling out large volumes of garbage from the camps and general lake area. There is one mountain toilet at Slide Lake. Sanitation issues with exposed human waste and toilet paper are a problem as not all visitors use the toilet.

Based on trail register data and ranger reports one would expect to see relatively little use mid-week along the Slide Lake trail, but on weekends during the peak months of July and August, one would expect to see more groups, up to 10 or more. At times those encounters would exceed the average encounters allowed (eight) within this class of wilderness.

In summary, two of the six monitored sites at the lake exceed wilderness standards and guidelines. The use on peak weekends at Slide Lake may exceed the average encounters allowed, but not the maximum.

Enjar Lake

In the LRMP Enjar Lake Trail is a difficult level, hiker only trail, gaining 1200 feet elevation in three miles. It is accessed from the Slide Lake Trail and begins its journey at the southern most Slide Lake basin campsite at Otter Creek. It is not maintained. It is basically a boot-path and is difficult to follow for the first 1.5 miles due to it crossing several slide chutes clogged with head high brush. The path exists in the brush, but it can be very difficult to find and follow. Once through the heavy brush, the rest of the trail is relatively easy to follow as it travels through big timber. The trail is characterized by a moderate number of blow downs that often obscure the trail and eventually new paths develop around them. Even in the upper section where the trail is most apparent, one needs to carefully look for it.

Inventory and monitoring in 1991 found five campsites at the lake. In 2010, the ranger reported that two of the five sites no longer exist, or could not be found. A third one had been rehabilitated at some point in the past and did not show signs of reuse. The report noted there are two primary campsites that receive the bulk of use at the lake. One of the two sites appears to have become more impacted over the years, as observed by the ranger in 2010. This site in 1991 had 1,102 square feet of vegetation loss, which exceeds the standard for this area. The other site does not seem to have changed from the last time the ranger was in the area in 1997, but no data was collected at this site in 1991, so it is unknown if it is within wilderness area standards and guidelines.

Trailhead regsiter data indicates that approximately 9 groups visit the lake each season. Due to the distance from the trailhead and the challenging nature of accessing the area, it is highly probable that neither the average daily encounter, nor the maximum encounter is exceeded. In summary, one of the two campsites at Enjar Lake exceeds LRMP standards and guidelines but the average and maximum encounters likely are not exceeded.

Arrowhead Lake

There is no trail to Arrowhead Lake. There is one campsite at the northeastern shore. Inventory and monitoring completed in 1985 indicate that vegetation loss at the site was not exceeding standards. The ranger's observation in 2010 indicates that there has been no degradation of the condition of the site since last visited by the ranger in 1996/1997. There is no evidence of recent cutting of trees.

No person using the Slide Lake Trail Registration identified Arrowhead Lake as their destination. Visitors could also be accessing this lake from another road access. Due to the presence of a small but well established campsite at the lake, Arrowhead Lake does receive some use. From the lack of use data and difficult access, it is assumed that the average and maximum encounters at Arrowhead Lake are within standards. In summary, Arrowhead Lake is within LRMP standards and guidelines for wilderness areas.

Whale Lake

There is no trail to Whale Lake. People may access Whale Lake from Enjar Lake or from another road access. In the 1989 inventory of this lake, there were six campsites identified. The ranger found in 2010 that two of the sites no longer exist, two of the sites appear unused, and the remaining two sites continue to receive use. One of the sites with continued use in had 499 square feet of vegetation loss 1989 and it is likely that it now exceeds the LRMP guideline of 500 square feet. The other site was not monitored in 1989 and its status relative to LRMP standards and guidelines is not known.

Slide Lake Trail Registration use data shows that an average of 3.5 groups visit Whale Lake each season. From this data, it can be assumed that the average encounter and maximum encounter are not exceeded at Whale Lake. In summary, one of the two campsites at Whale Lake is likely exceeding LRMP standards and guidelines for vegetation loss, but the average and maximum encounters are within standards.

Jordan Lakes

Campsite inventories from the early 1980s indicate that there were thirteen camps around the lower lake and eights sites along the upper lake. In 1991, further monitoring found that four of the initial sites on the lower lake were no longer being used, or could not be located on the ground, one site was on top of a boulder field and two did not have monitoring completed. Of the six sites inventoried in the 1991, three exceed standards for vegetation loss. The three sites that exceed standard are large heavily impacted sites which receive the primary use for the lower lake. A ranger report from 2002 indicates that approximately four sites at Lower Jordan, including the three that exceed standard, continue to receive consistent use.

In 1991 the monitoring at Upper Jordan Lake indicated that of the eight sites inventoried in the 1980s, one could not be found, and seven remained. Of the seven sites, one was closed and rehabilitated. Of the six remaining sites, one campsite exceeded standards for vegetation loss. In 2002 the ranger reported that this site continued to receive the main use for the lake. In addition, there were two other smaller, less established sites also being used. The other three sites identified in the 1991 monitoring report were not found in 2002.

Rangers have typically found lots of garbage at both lakes. There is a mountain toilet at Lower Jordan Lake, but no toilet at the upper lake. Sanitation issues with human waste and toilet paper are a problem at Jordan Lakes.

A ranger report from 2002 indicates that 10 overnight visitors were encountered on each of the two trips into the lakes that season. This would have been peak season, weekend use. It is possible to surmise from this limited data that the average encounter (five) might be exceeded occasionally. The maximum encounter (ten) is most likely within standards for the Jordan Lakes.

In summary, three of the four sites at Lower Jordan, and one of three sites at Upper Jordan exceeded LRMP standards for vegetation loss. It is possible that Lower Jordan may exceed the average daily encounter occasionally but rarely, and Upper Jordan does not. Neither lake is believed to exceed the maximum encounters.

Jug Lake

Jug Lake is accessed via Arrow Creek, at approximately MP 17 on the Illabot Road. There is a wide spot near the bridge where people park. There is room for only a few cars. There is no trailhead, signboard, toilet or registration box. There is no inventory or maintained trail to Jug Lake.

Inventories in 1989 found four campsites, none of which exceed LRMP standards. Of these 4 sites, one site is more heavily impacted. There is a mountain toilet at the lake, but the condition of it is not known. One party registered at the Slide Lake trailhead for a day trip to Jug Lake. Other than that one trip, there is no use data for this lake. It is difficult to determine without adequate information if the average and maximum encounters are exceeded. It is likely that they are within standard. In summary, there are no indications that wilderness standards and guidelines are exceeded at Jug Lake.

Other Recreation Uses

Some visitors accessed Found Lake, Snowking Lake and Mountain, Mt. Tommy Thompson from the Slide Lake Trailhead. Visitors access these areas to hike, backpack, fish, camp, and mountain climb. It all requires cross-country travel through remote, challenging terrain, and offers a unique wilderness experience. These destinations are about 2.25% of the registered use for the Slide Lake Trail. Illabot Peaks and Mt. Chaval can also be accessed from the Illabot Road as well as other portals.

Car vandalism sometimes occurs at trailheads although not many have been reported at the Slide Lake Trailhead. It has been reported that some expert paddlers pack from the Illabot Road to Illabot Creek and do a challenging white water trip through the gorge downstream of Bluebell Creek.

Economic Benefits

It is not known how much visitors to the Illabot area contribute to the local economy. From the trailhead register data about 10% of users were from the local communities of Darrington, Rockport, Concrete, and Lyman and would already be contributing to the local economy. Visitors to the Illabot area from more distant areas may contribute to the local economy through the purchase of gas and food although many would have brought these from their home area. Of the 332 average annual registered visitors an estimated 91% were from non local communities. If 300 visitors stopped and bought $20 each in food or gas, potentially $6000 could be spent annually between these four local communities. Four years of register data was averaged and about 34% of the visitors were from Mt. Vernon/Burlington/Sedro Woolley/Islands, 20% from Seattle/Tacoma/Olympia, 20% from Everett/Marysville/Arlington, 13% from Bellingham/Blaine/Lynden, 4% out of state, 4% Lyman/Concrete/Rockport, and 5% Darrington.

Hydrology and Soils

Geography

The Illabot drainage is situated east southeast of the town of Rockport Washington, where Illabot Creek enters the Skagit River at River Mile 71.8 (River KM 115.6). Elevations ranging from 80 m (262 ft) at its mouth to over 2,265 m (7,433 ft) at the summit of Snowking Mountain. Most of the watershed drains mountainous terrain, with approximately 26% of the watershed between 500-1000 m and approximately 59% over 1,000 m. Illabot Creek emerges from a confined valley, deposits sediment on an alluvial fan and runs through the relatively flat terraces and floodplain of the Skagit River.

Geology

The majority of the drainages are steeply sloping first and second order channels. The watershed runs NW-SE approximately 120 degrees to Straight Creek Fault which divides the watershed in two. The lower watershed or 40 percent, is comprised of meta-sedimentary and meta-volcanic rocks, and the upper watershed is comprised of crystalline rocks, granitic intrusive igneous and gneissic rocks (Brown, et al. 1987). Extensive glaciation occurred during the Pleistocene, leaving a veneer of till covering the upper slopes (Snyder & Wade. 1970) and thick accumulations of glacial outwash gravel, terrace deposits in the Skagit Valley (Klungland and McArthur. 1989), where Illabot Creek crosses old river terraces and occupied a series of isolated Skagit River side channels and meanders.

The Blue Bell Creek area is an ‘in-filled fault trace’ where glacial ice scoured out the zone of weakness and this hollow was later filled with retreating glacial deposits. It was

an outwash or water gap for water flowing from the glacier impoundment to the north into the Suiattle Drainage. Underlying bedrock is sheared phyllite, a mechanically weak meta-sedimentary rock unit. These zones of weakness, weathering zones are the direct result of an alteration of a mechanically weak or marginally competent rock by shearing or faulting. High concentrations of sub-surface water are commonly associated with these weathering zones. Changes in surface and sub-surface water routing that are commonly associated with poor road drainage may increase the amount of water in these shear zones and result in a higher frequency of inner gorge and slope failures.

A fault trace at Arrow Creek is noteworthy due to the major rock unit change in the drainage. Upslope mass-wasting is illustrated by talus slopes covered with large rock boulders that are blanketing the canyon walls.

Meteorology / stream flow

Precipitation ranges from over 150 inches at the higher elevations to around 60 inches along the Skagit River at the confluence with Illabot Creek. Snow dominates the upper elevations, above 3500 feet, where deep snow packs form over winter. Natural turbidity occurs during the summer and fall originating from high elevations glaciers and permanent snowfields. The rain-on-snow zone of the western Cascades, 1500 feet - 3000 feet, comprises a large portion of these watersheds. Winter rain-on-snow storms result in most of the annual peak flows from these watersheds.

Soils

Soils for the project area are described and mapped in the Mount Baker National Forest Soil Resource Inventory (USDA Forest Service1970). The Soil Resource Inventory (SRI) describes the soils in the Illabot Drainage area as glacial till of granitic origin. Deeper soil units are located along the valley bottom with remnant terrace deposits, inclusions of deeper outwash material in lower portions of tributaries. Upper slopes soils are shallow to moderately deep soils derived from residuum and till. From Arrow Creek to the headwaters in the upper basin, the parent material for these soils is of granitic origin (igneous or gneissic). Below Arrow Creek, the soils are derived from meta-sedimentary and volcanic rock (green-schist and Darrington Phyllite). Instability can occur with deeper soils and is directly related to steepness of slope and concentrations of water. Stable soils are generally located in the upper tributary valleys.

Soil types that are prone to land sliding in the Northwest Cascade Region (Skagit / Sauk/ Nooksack) have similar glacial histories, parent materials, landforms, and textures. This is evident when comparing the results of studies in the lower Skagit and Baker Lake valley by Heller (1978), studies of the Finney Creek area by Paulson (1996) and Parks (1992), and studies of erosion in the Nooksack River by Peak Northwest (1986).

Unstable Soils

Unstable soils are more likely to move from their place of origin as a result of erosion, landslides or other processes. Soils that end up in streams will increase turbidity in flowing waters and settle out on the stream bottom. The result is degraded water quality and stream function for humans, plants and animals. Uncontrolled drainage resulting

from unmaintained, damaged and/or non-functioning culverts and ditches will increase the risk from unstable soils.

Increases in slope and water are major factors in soil instability. Unstable soils are most likely to occur where there are former glacial lake sediment margins; along the steep side slopes; margins of in-filled channels; and in faulted stream channels. Unstable soils that cross the road and extend to Illabot Creek increase the potential for the whole slope to "unravel" if failure occurs and for sediment to be deposited in Illabot Creek.

Information on locations and characteristics of unstable soils was developed based on published soils data, field reconnaissance, and Geographic Information Systems (GIS) analysis as follows:

Published Soils Data

Soil instability in Illabot Creek drainage is associated with SRI unit 24, 26, 29, 38 and SRI unit 78 (deeper soil units). Instability is primarily due to steepness of slope. Slope breaks range between 35% and 70%. Illabot Road either skirts or crosses short sections of these soil units.

The following is a detailed description of each of these soil types:

- Soil Units 24, 26 and 29– a silty sand, sand silt mixture, Unified Soil Classification SM-SMd. This soil occurs as a deep soil 12+', slightly plastic to plastic material derived from glacial till. Moisture ranges from 10-33%, classified moist and has a loose compactness. In-place CBR (California Bearing Ratio) is 15-40. Saturated CBR is 3/ shear strength of 12.5 (psi). Soil rates as moderate to low permeable soil in sub-soils.

- Soil Unit 38– a gravel-sand, sand-gravel mixture, Unified Soil Classification GP-SP. This soil occurs as a deep soil 12+', non plastic material derived from glacial till. Moisture ranges from 10-33%, classified moist and has a loose compactness. In place CBR (California Bearing Ratio) is 10-40. Soil rates as rapid to moderate permeable soil in sub-soils. This soil is stable when located on flatter slopes.

- Soil Unit 78. A silty sand to clayey slit with slight plasticity, Unified Soil Classification SMu-SC. Soil is fairly deep, 12'+, moderately compact, derived from glacial drift. Bedrock is composed of highly incompetent, highly fractured shist. Soil is well to moderately well drained. Soil rates as rapid permeability in surface soils and moderate in sub-soils moderate permeable. In-place CBR (California Bearing Ratio) is 10-40.

In addition to the SRI, another unstable soils classification was developed for the 1990 Mount Baker-Snoqualmie Land and Resource Management Plan. These soils are identified as S-8 soils. S-8 Soils are defined as "soils for which clear cutting or road building activities result in a 75% probability of doubling the mass wasting occurrence". S-8 soils are considered as unavailable for road construction and timber harvest. In addition, an area approximately 1/8 mile wide surrounding S-8 soils may have special

management considerations applied including avoidance by roads. (USDA Forest Service 1990).

Field Reconnaissance

Soil Units 24, 26, 29 and 38 inclusions were field-identified in several locations along FSR16. Milepost locations where these soils were found above the road and the length of these soils measured parallel to the road (in parentheses) are: MP 13.912 (275'); MP 14.0 (170'); MP 14.34 (180'); and MP 15.745 (no field measurement). Past road design handled these sites with log cribbing to buttress the toe slope of the cuts. Where these soils are located below the road MP 12.94, MP 17.70, and 18.0 riprap fills have been used. Moderate road alignment shifts of 10'-12' would be a much more suitable and long-term solution since it moves the road away from the steep fill-slope and moves the road onto more suitable material and off the slope break of the deeper soil units.

GIS Analysis

GIS Analysis of S8 soils and SRI soils identified as unstable (see above) indicates that these soils occur in the following locations:

- Unstable soils generally underlie or are in close proximity to the first half of the FSR 16 road, from MP 8 to MP 16.

- Unstable soils underlie the majority of FSR 1620, with the exception of a portion of the MP 1-2.

- Areas of local instability include locations where Illabot Road enters or exits remnant terraces of glacial outwash along major tributaries. These areas of instability include areas above, below and under the major stream crossings of Iron, Bluebell and Arrow Creeks.

Of the 383 culverts in the study area roads, almost 50% are located on unstable soils.

Sediment and Drainage

(*the following two paragraphs are excerpted from Smith and Ramsden 2006*)
There has been quite a bit of work on sediment issues in the Illabot Creek watershed. This has included an inventory of sediment delivery to streams from mass wasting in the upper watershed (Paulson. 1997), restoration treatments on forest roads to reduce sediment inputs to Illabot Creek by the Forest Service and in O'Brien Creek by Seattle City Light, and a monitoring project to evaluate the effectiveness of sediment reduction efforts in Illabot Creek (Beamer, et al. 1998).

The work of Paulson (1997) showed a significant increase in sediment production caused by roads in the past several decades but that sediment supply overall in Illabot Creek as of 1991 was less than 150% of background rates, which is relatively low compared to other heavily managed watersheds in the Skagit River basin. Beamer et al. (1998)

evaluated conditions in lower-gradient response reaches downstream from sediment inputs in Illabot Creek and determined that residual pool depths had not increased sufficiently to detect a change as a result of road improvement projects. But because sediment supply rates were already relatively low, they concluded that there were not ongoing impacts from forest roads at the time and the best approach was to monitor for negative changes in the future.

It should be noted that these studies were broad scale studies based on limited field analysis and interpretation of historical air photos from 20 years and longer ago. In addition, the analyses did not include much of the site specific data used for this analysis: detailed field analysis including examination of all aspects of the road infrastructure (culvert, ditch, road condition), hydrology, soils, geology and topography; and development of a related database. The road layout was specifically analyzed relative to geology, site-specific soil inventory data was used, and analysis of unstable soils data and mapping and hydrologic data and mapping was completed. A couple of examples of application of this kind of updated information are as follows:

> Drainage failures often are reflective of systems that have frequent road stacking (multiple road crossings above one another). Drainage failures are frequently the result of undersized, poorly spaced or worn out culverts and the increase in drainage density caused by the roads intercepting both surface and sub-surface water. Between MP 8-9.6, the Illabot Road crosses headwall areas where the slope is dissected by tributaries with potential for high sediment delivery potential. These locations were mapped as soil units 26 or 712 (shallow soil over bedrock with inclusions of soil unit 26) and one stream draw crossing of soil unit 78. As discussed above in the soils section, these soil types are unstable and are more likely to lead to slope failures and introduction of sediment into Illabot Creek, particularly when they are saturated and/or located on steep slopes.
>
> Surface water features other than Iron, Blue Bell, Arrow and Illabot Creek are characterized as small stream channels. These small streams are also included in the riparian reserves and in many cases are subject to bank failures and erosion due to increase and concentration of surface flow by the constructed forest road drainage system. Bank failures and erosion on small streams are very likely to result in sediment introduction to Illabot Creek since streamflows are present as a transport mechanism to move sediment to the Creek.

Another major factor that increases the risk of a catastrophic slope failure and a resulting influx of sediment to Illabot Creek is the frequency of road maintenance and the specific road segments that are maintained. Culverts and ditches that are clogged with sediment are at high risk of inducing slope failure, either directly or indirectly. For example, culverts clogged with sediment are more likely to overtop during storms, directly causing erosion and slope failures, while water flowing over sections of roadways due to unmaintained ditches may saturate fill-slopes, indirectly leading to slope failures.

How often and how much of the road is maintained will determine the likelihood of slope failures and sediment influx to Illabot Creek. Decreasing funding for road maintenance has and will likely to continue to reduce how often and how much roadway is maintained.

Therefore this will compound the already high likelihood of sediment influx to Illabot Creek as a result of the interplay between road infrastructure and layout, hydrology, soils and geology.

Additional observations are presented below in the "Analysis Results" section below.

Past Road Treatments

Past road treatments in the Illabot Watershed are described in detail in Smith and Ramsden 2006, Rivers and Roads 2010, and the Engineering Specialist's report for the Illabot Road Decommissioning Project. In the last couple of decades (1995 to present), segments of the FSR 16 system within the National Forest have received upgrade, storage, or decommissioning treatments. Table 2 is a summary of those treatments within the Illabot Watershed:

Table 2: Forest Service Road Treatments Since 1995

Year	Road	Distance (miles)	Treatment
1995	FSR 16	11.1	Storm-proofed (culvert replacement)
1995	FSR 1600012	0.2	Upgrade
1995	FSR1600012a	0.6	Decommission
1999	FSR 16	2.9	Storage
1999	FSR 16	3.2	Upgrade
1999	FSR1620	0.4	Upgrade
1999	FSR 1620	2.4	Storage
2010	FSR 16	12.5(MP 8.0 to 20.5)	Upgrade
2010	FSR 16 – at MP 8.8	-----	ERFO Site – Slope Failure Repair

Consultant Focus Areas

Six specific areas of focus were described in detail in the consultant report (Rivers and Roads 2010). These areas are at high risk of slope failure due to one or more of the following factors: geology, the layout of one or more road segments relative to the underlying and adjacent topography and geology, surface and subsurface flow paths and timing and amounts of flow, stream road crossings, stream erosion, and stream sediment loads. Slope failures that result from these factors are likely to deliver sediment to streams, resulting in detrimental effects to stream biota and natural function.

Focus Area 1

Three sections of FSR 16 from MP 8.4 to MP 9.58 have problems. This area drains to the north into an unnamed creek. Subsurface flow tends to be shallow and water is concentrated from road stacking and misdirected from an abandoned, un-maintained mid-

slope road. Road stacking is a series of roads running roughly parallel to contour lines and each other that cross the same section of hill- or mountain-side. Each of these roads captures and conveys water from the hillside to culverts that feed the same streams. In this way, drainage that was dispersed before the roads were built is now concentrated, causing increased flows in the receiving streams and increased risks of slope failure.

Down slope failures are common (averaging 1 every 10 years) on FSR 16 in this area. A project to remedy a culvert / slope failure was constructed in this reach in 2010. The consultant indicates that:

> "Based on the combination of terrain, underlying geology and hydrology coupled with maintenance issues, FSR 16 between MP 8.0 and 9.5 is most vulnerable to failures in the immediate future."

Focus Area 2

Stream bed-load interruption is a drainage-related issue. There are three noteworthy locations on the Illabot Road where drainage structures interrupted bed-load movement and resulted in scour below the road and the channel downstream. The two worst cases were created by vented fords (culverts with concrete pads) at MP 15.745 and MP 17.35. The vented ford at MP 15.475 has interrupted bed load movement and resulted in the formation of a severe chasm where greater than 300 cubic yards of material has been eroded by the stream channel (over a >250' length of channel).

At the MP 17.35 vented ford, located just before Arrow Creek, the bed load disruption has resulted in the slope below the road eroding away and the only thing keeping the road prism from collapsing is a cedar log that is acting as a partial retaining structure spanning the gully beneath. The third site, on Iron Creek is located at MP 12.36 where an undersized culvert has created a very notable scour pool and downstream scour on one of the larger tributaries.

Focus Area 3

Saturation of the roadbed between MP 20.7 and MP21.2 on FSR 16 is causing sidecast slumpages of varying deflection.

Focus Area 4

Road 1600.019 (is located on a concave slope, with 6 or more culverts. If culverts are not removed, diversion from blocked culverts will eventually result in concentration of water and channel re-sizing (landslide) with sediment delivery to Illabot Creek.

Focus Area 5

FSR 1620 MP 3.3-3.8 crosses an active slide head wall area in this area that drains to White Creek. The scarp is primarily a shear zone that is subject to differential settlement

resulting from high frequency of springs and shear nature of the bedrock on an over steepened face. The bottom of the slide face is a wide bench - likely an ancient slump block of larger proportions. This section of road has been problematic to maintain in a drivable condition in the past.

Focus Area 6

Road 1620 between MP 4.9 and the end of the road (MP6.39) is located in a part of the headwaters area of Iron Creek. This road segment has the potential for failure that would directly affect road 16 below and delivery to Illabot Creek. Several areas of road side cast between culverts are failing with potential delivery to the next order channel downslope. There is frequent and noticeable sidecast slumping beyond MP 5.5. There are infrequent water bars between the culverts.

Culverts and Ditches

Culverts and ditches are the infrastructure that collects and conveys stormwater to streams. Culverts also provide for vehicular crossing of streams while allowing fish and other organisms to pass up- and down-stream. Inadequacies of this infrastructure not only cause limitations and potential hazards to vehicular access but can also have detrimental environmental effects. Water that cannot be conveyed in ditches that are filled with sediment might instead saturate road surfaces and road fill slopes, leading to slope failures and sediment deposition in streams. Culverts that are damaged or filled with sediment will not provide for adequate flow conveyance, roads might overtop and road fills over culverts and adjacent sediment may enter streams. The same concerns apply to bridges.

Conclusions from the culvert and ditch analysis are:

- Of the 23 “major” stream crossing culverts, only two are functioning properly. Non-functioning culverts along streams are very likely to cause sediment to move into Illabot Creek since stream flows will convey sediment to the Creek.
- There are a total of 383 culverts on study area roads. Of these, 235 (or 61%) are deficient, with most of these deficiencies requiring that the culvert be replaced.
- In addition to resolving non-functioning culvert problems, 125 new culverts are needed. These new culverts will allow for conveyance of stormwater runoff that might otherwise saturate the roadbed and fillslopes leading to slope failures and sediment influx to Illabot Creek
- Approximately ¾ of the roadway requires ditch work – either ditch cleaning or reconstruction. As mentioned above, ditches that are compromised or not functioning allow water to flow over the roadway, saturate fill slopes and greatly increase the risk of slope failures.

Wildlife

Federally Listed Threatened and Endangered Wildlife Species

The Illabot watershed has suitable habitat for northern spotted owl, marbled murrelet, and grizzly bear. Northern spotted owls and marbled murrelets have been documented to nest in the watershed, but no surveys have been conducted in more than 10 years. There are no confirmed records of grizzly bear in the watershed. But a confirmed sighting was made 10 mile northeast near Cascade Pass in 2011.

Wolves have not been detected in the Illabot Creek watershed. Howling surveys in the adjacent Cascade River watershed occurred in 1991 and failed to detect any wolves. Due to the low density of deer and elk, the watershed is not believed to be suitable habitat for resident wolves.

Most of the National Forest System land in the Illabot watershed, and all of the land accessed by Road 16 east of its junction with Road 1620 is Late-Successional Reserve (LSR). LSRs are managed in part for the recovery of spotted owls and marbled murrelets. The Forest-wide LSR assessment (USDA 2001) determined that 78% of the habitat capable area in Illabot LSR is currently suitable habitat for spotted owls and marbled murrelets. Including critical habitat in the adjacent wilderness, 80% of the habitat capable area is suitable habitat. The desired condition for LSRs is 80% suitable habitat. The Illabot LSR is one of five of the 16 LSRs on the Forest that meets the desired habitat conditions and is lowest priority for vegetation management as a restoration treatment.

Regional Forester's Sensitive and Survey and Manage Wildlife Species

The following species are either documented or suspected to occur on the Mount Baker-Snoqualmie National Forest: Puget Oregonian (snail), evening fieldslug, warty jumping-slug, Oregon megomphix (slug), shiny tightcoil (snail), Johnson's hairstreak butterfly, peregrine falcon, common loon, bald eagle, harlequin duck, larch mountain salamander, Van Dyke's salamander, Townsend's big-eared bat, and wolverine. The first four sensitive species are also survey and manage species.
There is no potential habitat for peregrine falcon (cliff habitat), common loon (large lakes), and larch mountain or Van Dyke's salamanders (range south of US 2).
Two bald eagle winter night roosts are located along Illabot Creek within one mile downstream of its confluence with Marten Creek. At its nearest point to the upper roost, Road 16 is approximately ¾ mile from the roost.

Johnson's hairstreak butterfly, harlequin duck, Townsend's big-eared bat, and wolverine may be present in the watershed, but their presence has not been verified. A radio-collared wolverine was detected in the Cascade River watershed approximately 12 miles east of Slide Lake.

Management Indicator Species

Management Indicator Species not previously addressed include mountain goat, pine marten, and woodpeckers (including pileated woodpecker).

Mountain goat habitat is present in the higher elevations ridges that define the watershed from Illabot Peaks east to Granite Lakes. Early 1960 population data estimate that there were 26 animals using this ridge system. Unsustainable recreational hunting likely resulted in most of the potential habitat being unoccupied. Based on aerial surveys in 2001, fewer than five animals are expected to persist and are limited to the area between Mount Cheval and Snowking Mountain.

Because of the high amount of mature and old-growth forest on National Forest System land, populations of woodpeckers are believed to be high.

Neotropical Migratory Birds

Many species of neotropical migratory birds occur in the project area.

Wild and Scenic Rivers

The Forest Service through the Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan, found all 16.3 miles of Illabot Creek, from its headwaters to its confluence with the Skagit River, both eligible and suitable for inclusion in the National System. Illabot Creek was found suitable due to the high degree of public support for its designation, Washington State Department of Fisheries interest, and its outstandingly remarkable fish and wildlife values.

In the Forest Plan, the upper 4.3 miles was classified as wild, with the remaining 12 miles classified as recreational. (Classification refers to levels of development).

- Segment 1 - Headwaters to Glacier Peak Wilderness boundary, 4.3 miles wild
- Segment 2 - Glacier Peak Wilderness boundary to confluence with Skagit River, 12.0 miles recreational.

Legislation to designate Illabot as a Wild and Scenic River passed one house of Congress in 2009, but not both houses. As a result, the river remains eligible and suitable for designation, but has not been designated.

Fisheries

Aquatic Habitat

The Skagit River basin is the most important salmonid-producing basin in the Puget Sound in terms of abundance, population diversity, and types of habitat. The eight anadromous salmonid species of the Skagit River comprise approximately 30 percent of all anadromous fish entering Puget Sound. Illabot Creek is an important contributor of anadromous fish to the Skagit basin.

Illabot Creek is a 15.1 mile long tributary to the Skagit River and enters at river mile 71.8. It passes through state and private land for the lower 4.8 miles and through National Forest System land for the upper 10.3 miles. Illabot Creek has five major tributaries: Martin Creek, Iron Creek, Bluebell Creek, Arrow Creek, and Otter Creek, along with

numerous smaller tributaries. The headwaters of Illabot Creek originate from glaciers and snow fields of Snowking Mountain, Mount Chaval, and Illabot Peak, in the Glacier Peak wilderness area.

Anadromous fish can easily access the lower several miles of Illabot Creek where low gradient habitat provides good spawning conditions for all species found in the upper Skagit watershed. Higher gradient reaches limit upstream passage at locations but several species (steelhead, bull trout, and coho salmon) are documented to use habitat to at least to the Road 16 Bridge.

Several lakes in the watershed provide habitat for resident fish these include Slide, Enjar, Jug, and Martin Lake. Fish populations in these lakes are maintained by fingerling stocking by WDFW. Resident fish are found in streams throughout the watershed, especially downstream of stocked lakes in Otter, Arrow, and Martin Creeks.

Habitat Characteristics

The current habitat conditions represent cumulative impacts of past management and recent hydrologic events that have occurred in the basin. Overall the habitat is still in good condition and supports important spawning and rearing habitat, especially for steelhead and bull trout. Description of habitat characteristics for fish is summarized by stream reach that are defined based on stream gradient, channel confinement and flow. Illabot Creek was divided into five reaches with similar reaches being used for surveys in 1992 and 2005. Water temperature in August is in the low 50's reflecting the glacial and snow melt runoff character of the watershed.

Reach 1
This reach begins at the Skagit River and extends upstream for 3 miles and is characterized by riffles and long shallow glides with little cover. Substrate is dominated by gravel with some sand. Large woody debris loading is low with most concentrated in small jams. The valley is wide, low gradient channel type with moderate sinuosity. This lower gradient reach displays cumulative effects of upstream land management. Sediment delivered to upstream transport reaches deposits in this lowermost reach and has reduced the number and area of pools by almost half over the 13 year time period between the 1992 and 2005 surveys. This reach is most accessible to salmon; especially Chinook, chum and pink, and represents the most degraded section of Illabot Creek.

Table 3. Reach 1 Habitat Summary

Measure	1992	2005
Residual Pool Depth (ft.)	2.9	4.0
Pool area (percent)	23.7	12.2
Fine sediment (percent <2mm)	n/a	9.5

Reach 2
This reach begins where the channel enters a bedrock canyon and extends 1.1 miles to the upper end of this canyon section. The stream is dominated by riffles and has some high velocity sections. Substrate is dominated by small boulders with some gravel. Large

woody debris loading is low due to the confined bedrock channel. The valley is narrow an pools range from 4 to 9 feet deep, providing holding areas for migrating fish.

Table 4. Reach 2 Habitat Summary

Measure	1992	2005
Residual Pool Depth (ft.)	3.7	5.1
Pool area (percent)	22.9	14.7
Fine sediment (percent <2mm)	n/a	3

This steeper more confined reach readily transports sediments downstream as reflected by the greater pool depth and low percent of fine sediment in the substrate, however even this reach has seen an 8 % reduction in pool area between 1992 and 2005.

Reach 3

This reach begins above the canyon section and extends up 3 miles to a small left bank tributary. The stream is dominated by riffles with some sections up to 6% gradient. Substrate is dominated by small boulders with some gravel. Large woody debris loading is higher in this section due to the riparian area contributing large logs. Pools range from 3 to 8 feet deep, providing holding areas for migrating fish. This steeper more confined reach readily transports sediments downstream as reflected by the pool depth and low percent of fine sediment in the substrate, pool area and number of pools in this reach remained steady. The valley is narrow with a Rosgen "B" channel type.

Table 5. Reach 3 Habitat Summary

Measure	1992	2005
Residual Pool Depth (ft.)	2.7	3.9
Pool area (percent)	6.7	7.6
Fine sediment (percent <2mm)	n/a	2.5

Reach 4

This reach begins at a small left bank tributary and extends above the Road 16 bridge. This section flows through the Illabot lake area, now a willow and alder stand. The stream is dominated by riffles with some sections up to 12% gradient. There are some partial or seasonal migration barriers in higher gradient areas. Substrate is dominated by gravel with some cobble. Large woody debris loading is high in this section due to the riparian area contributing large logs. Pools are generally smaller in this reach but still provide important areas for migrating and holding fish. Large numbers of bull trout and summer steelhead were found in several large pools of this reach.

Table 6. Reach 4 Habitat Summary

Measure	1992	2005
Residual Pool Depth (ft.)	2.5	2.6
Pool area (percent)	17.1	8.9
Fine sediment (percent <2mm)	n/a	13

Reach 5
This reach begins above the Road 16 bridge and extends to the end of the survey at stream 12.1. The stream is dominated by riffles with overall lower gradient. There are some partial migration barriers in short higher gradient areas. Substrate is dominated by gravel with some cobble. Large woody debris loading is moderate in this section with mature trees on the north bank and open avalanche slopes on the south. Pools are smaller with maximum depths from 2.5 to 5 feet. The valley narrows from reach 4 but has a Rosgen "C" channel type reflecting the lower gradient.

Table 7. Reach 5 Habitat Summary

Measure	1992	2005
Residual Pool Depth (ft.)	1.8	1.9
Pool area (percent)	12.6	10.6
Fine sediment (percent <2mm)	n/a	11.5

Fish Presence
Illabot Creek contains Chinook, coho, chum and pink salmon as well as sea-run and resident populations of cutthroat, rainbow (steelhead), and bull trout. Whitefish and sculpin are present also. Illabot Creek is one the most important tributaries in the Skagit River watershed for bull trout and steelhead. The stream also provides excellent habitat for tributary-spawning Chinook salmon.

Table 8. Listed Fish within the Project Area

Species	**ESA listed Threatened**	**Designated Critical Habitat**	**MSA Essential Fish Habitat**	**USFS Region 6 Sensitive**	**MBS Management Indicator Species**
Chinook salmon	X	X	X		X
Coho salmon			X	X	X
Chum salmon					X
Pink salmon			X		X
Cutthroat trout				X	X
Bull trout	X	X			X
Steelhead	X				X
Rainbow trout (resident)					X

Fire and Fuels

The benefit of road access to fire suppression is typically ½ mile or less. Beyond that distance, terrain and fuels prevent effective ground resource penetration. Response to any fires more than ½ mile from a road or trail will typically be from aerially delivered

suppression resources. From 1986 through 2009 there have been 4 fires within ½ mile of a road on National Forest System land in the Illabot watershed. One of the four fires was caused by human activity. Average annual statistical fire occurrence on the MBSNF over the last 34 years is 44 fires per year: 41% lightning caused and 59% human-caused.

The Forest road system provides both benefits and costs to the fire management program as it relates to ignitions, access, and control. Roads that are open to the public provide increased access to initial attack resources, and can act as fire control lines. This benefit is offset by the increased public access and the human caused ignitions that come with it.

Roads that are closed also provide varying degrees of access to initial attack resources, ranging from full vehicular access down to rough trail like conditions that allow resources to hike closer to a fire. These roads can also be easily improved by mechanized equipment to perform as fire control lines. The risk of human ignitions is less along these corridors.

Roads that have been decommissioned can often still provide rough trail like conditions to allow initial attack resources to hike closer to a fire. With moderate improvements, these road beds can still be converted into fire control lines. The risk of human ignitions is less along these corridors.

Rare and Invasive Plants

No documented Sensitive or Survey/Manage plant species are known in the Illabot watershed, but suitable habitat is present. Invasive plant surveys conducted in 2010 found one population of each of the following species: orange hawkweed, meadow hawkweed, herb Robert, and butterfly bush.

Heritage Resources

During the early contact period between European immigrants and native Indians, the Indian people who used the Illabot Creek drainage employed a settlement pattern that included permanent but dispersed winter village sites. Two villages existed near the mouth of Illabot Creek; in these two villages combined, there were seven winter houses. Despite the existence of permanent winter villages, resource gathering activities involved an annual seasonal round in which summer camps were visited year after year to collect and process important plant and animal resources.

Summer encampments in the higher elevations would have been common, for upland game and grouse, as well as for berries and root gathering. Foods collected during the summer were processed and stored for year-long use. High-elevation hunting and gathering activities supplemented fishing as the most important food, however, the farther away from the ocean a group's winter villages were, the greater reliance on hunting as a source of animal protein.

Religion was central to the lives of the Northwest Coast people, including the people traditionally living in and around Illabot Creek. Traditional religions involve a belief in guardian spirits that assist people in their daily lives by providing useful skills and/or healing and heath. Guardian spirits may be found in a variety of places, and a quest may

include collection of raw materials, ritual meditation, fasting and bathing and places where cedar and pure, clean water occur in a place of relative solitude (Blukis Onat and Hollenbeck, 1981). Certain areas in the Cascades have these qualities. Today, people from the Indian Communities of the Skagit and Stillaguamish basins use the Illabot Creek area to hunt, fish, and continue their cultural activities that allow them to connect to the people in their families that went before them (Bush and Rowland 2011:23).

Development of the concrete industry, bountiful timber, and the expanding railroad up the Skagit River (reaching Sauk City, at the mouth of the Sauk River in 1900), contributed to the settlement of the Skagit river and its tributaries by non-Indian people. Thomas Porter settled on a 167-acre parcel on Illabot Creek to raise dairy cattle. Illabot Creek, above the Forest boundary near Marten Creek, became part of the Washington Forest Reserve in 1897. A trail followed Illabot Creek to Illabot Lake as early as 1913, and there were small structures, probably trail shelters along the route. Another trail appears to have followed the ridgeline between Illabot Creek and the Sauk drainage to Illabot Peaks (Washington National Forest Map 1913, Mt. Baker National Forest Map 1932, 1935).

A cultural resource survey (pedestrian survey) was conducted of the area of potential effect (APE) in the summer of 2010. No evidence of pre-contact activity was found within the APE for this project. If archaeological sites are present within the APE, they may have such a low density of artifacts that they cannot be located given the lack of organic preservation, forest vegetation, soil development, past disturbance, and sampling strategy. Remains and remnant features representing logging activities from the 1960s were identified in the project area. No cultural resources eligible, or recommended eligible for the National Register were identified during field investigations (Bush and Rowland, 2011:40). No Traditional Cultural Properties have been identified.

The Forest Service consulted with the Upper Skagit Indian Tribe, the Swinomish Tribe, Sauk-Suiattle, the Lummi Tribe, the Samish Tribe and the Nooksack Tribe. The Tulalip Tribes, the Sauk-Suiattle Indian Tribe and the Swinomish Tribal Community responded to the Forest Service. Each of these Tribes identified the Illabot Creek drainage as a culturally important area, and stated that their members have used, or currently use the Illabot Road system to access the upper elevation habitat for hunting, gathering, and/or fishing, activities vital to the perpetuation of their traditional culture.

CHAPTER 4 ENVIRONMENTAL EFFECTS

Introduction

The environmental consequences are discussed in two sections: environmental consequences relating to the five significant issues; and other environmental consequences. In both sections, direct and indirect effects are discussed first, followed by a discussion of cumulative impacts where relevant.

Environmental Consequences of the Major Issues

Recreation Use in the Illabot Watershed

Short Day Hikes

Alternatives P and R would eliminate short day hikes in the Illabot Watershed (Table 9). Increased distance and difficulty in access would change the type of user who would go to the area. Beginners, children, families, the elderly, or people with conditions that limit their physical ability would not visit this area.

Alternatives N and U would maintain one short day hike that would allow beginners, children, families, the elderly, or people with conditions that limit their physical ability would still recreate in the area. Recreation use may increase as a result of the increasing awareness of this area. However, without upgrades, Alternative N could result in a loss of road access at any time and would also eliminate the one short day hike. Alternative U may also result in the loss of this short day hike if the road fails at MP 15.3 and a solid rock foundation does not exist and repair is not possible.

Alternative M would increase opportunities for short day hikes in the area. Use by those pursuing short day hikes would likely be re-distributed to the two short day hikes to Falls and Marten Lakes and the longer day hike to Jordan. The availability of multiple short day hikes may result in less use at Slide Lake and increased use at the others.

Table 9. Changes in recreation opportunities in the Illabot Creek Watershed.

	Alt. N	Alt. P	Alt. U	Alt. R	Alt. M
Short day hikes	1	0	1	0	4
Additional miles to reach high lakes	0	7.5 to 10.75	0	3 to 6.1	-3 to -5

High Lakes Fishing

With Alternatives N and U access to 10 high lakes would continue as it currently is. However, as described above, road failures are likely with Alternative N because of the deteriorated road infrastructure and access to high lakes fishing could become more difficult. Even Alternative U access to high lakes could be more similar to Alternative R if the road fails at MP 15.3 and repairs are not possible due to the lack of a solid rock foundation.

Alternative P would add 7.5 miles of scrambling over the decommissioned road to reach the current Jug Lake access point (or could possibly be accessed from Road 2642), and an additional 10.75 miles to reach the nine other lakes. This alternative is expected to dramatically decrease high lakes recreation use.

Alternative R would add 3 miles of scrambling over the decommissioned road to reach the current Jug Lake access point (or could possibly be accessed from Road 2642), and an additional 6.1 miles to reach the nine other other lakes. It is likely that fishing use at the lakes would decrease, especially at Slide Lake where day use would be eliminated. Total

use would be expected to decrease with fewer people visiting the area while the length of stay would likely increase. Some use of mountain bikes would occur on the 6.1 miles of road converted to trail to reduce the time it would take to get to the lakes.

With Alternative M, access to Slide, Enjar, Whale and Arrowhead Lakes would continue as it currently is. Access to Jordan, Marten and Falls Lakes would be improved. The trail distance to these Falls and Marten Lakes would be 1.5 and 1.0 mile, respectfully, making them all available as short day hikes while Jordan Lake would be a longer day hike at 4.0 miles. Fishing would likely increase at these four lakes, which may result in less use at Slide Lake.

Wilderness Use

Alternatives N and U would retain the current short access to wilderness. All five lakes with campsites that exceed LRMP standards for vegetation loss are expected to continue to exceed standards.

With Alternative P, the additional 10.75 miles of hiking to reach the Glacier Peak Wilderness area in the Illabot Creek watershed is anticipated to greatly reduce the number of visitors and only a few of the most skilled recreationists would venture here. There would be an increase in opportunity for those few seeking a remote, isolated wilderness experience to have more solitude since there would be fewer people in the wilderness area. Most of the five campsites at Slide, Lower and Upper Jordan, Whale, and Enjar Lakes that currently exceed standards for vegetation loss would likely revegetate, due to greatly reduced use. However, due to the expected continued overnight use and the long recovery time for the vegetation, some camps might continue to exceed standards for some time to come. Visitors may start accessing Lower and Upper Jordan Lakes from the closed roads on the private land north of the National Forest since it would be shorter.

Alternative R would require an additional 6.1 miles of hiking to reach the wilderness area. It is anticipated that the number of visitors would be reduced as day use would be largely eliminated. Some use of mountain bikes would occur on the 6.1 miles of road converted to trail that is expected to result in less reduction in wilderness use. This alternative would reduce opportunity for a wilderness experience here for some people (children and persons with limited mobility or time), but increase opportunities for those seeking a remote, isolated wilderness experience, and for those that want to have more solitude.

Slide Lake would likely continue to have two campsites that exceed the standard for vegetation loss. Most of the campsites at the other lakes within wilderness would likely recover due to reduced use and through time recover to within LRMP standards. However, due to the expected continued overnight use and the long recovery time for the vegetation, some campsites might remain impacted. The number of encounters would be reduced to within LRMP standards since it would no longer be a day hike to Slide Lake.

Alternative M would decrease the distance to the wilderness boundary from the Jordan Lake trail by 3 miles and increase use of this portion of the wilderness. Slide, Enjar,

Whale, Lower Jordan, Upper Jordan Lakes within wilderness would continue to have five campsites that exceed the standard for vegetation loss. Average encounters and maximum encounters would likely remain constant or increase with this alternative.

Cumulative Effects

Past road closures in the Illabot Creek that impacted recreation access are limited to the closure of Road 16 at MP 24 in 1999 and the closure of this road at MP 20.5 in 2010. Since these closures are on the same roads considered in this analysis, they do not add cumulatively to any alternative. Road closures on private lands to the north have limited access to high lakes and the wilderness area in the Illabot Creek watershed to Road 16 and the effects of these closures are considered in the direct and indirect effects above.

There are several sites along Road 16 where proposed upgrades with alternatives U, R, and M may not prevent future large road failures that would not be repairable. This type of failure could occur at any time, and if not repairable, would result in effects comparable to Alternatives P or R.

Because future funding for road maintenance is expected to decline, Road 16 beyond Slide Lake would not likely be maintained if Alternative M is implemented. As a result, impacts to recreation use would be expected to become more like Alternatives N or U within 15 years.

Cumulative Reduction in Total District Recreation Opportunities

The analysis area for this issue is the southern portion of the Mt. Baker District. This area includes all of the Ranger District except the North and Middle Fork Nooksack watersheds.

Trails Affected by Road Closures

In the past nine years 7 of 34 trails on the southern portion of the Mt. Baker Ranger District have been affected by road closures or flood damage. These past actions reduced the number of short day hikes and made access to lakes more difficult.

Trails with Short Day Hikes to Lakes Affected by Road Closures

In addition to Slide Lake, there are four other round trip short day hikes of 6 miles or less to lakes on the southern portion of the district that offer a similar hiking experience. Cumulatively, 1 of 5 trails with short day hikes to lakes would be eliminated with Alternatives P and R. The result could be a combination of fewer people hiking (especially children and elderly), increased use at the remaining short day hikes to lakes, and visitors going outside of the area evaluated.

Lake Fishing Affected by Road Closures

There are nine lakes on the southern portion of the district where fishing occurs and visitors hike in on a maintained trail. An additional 16 fishing lakes are accessed from non-maintained trails, or cross-country routes. Past actions increased the hiking distance to Elbow, Shuksan, Found, Skaro, Neori, and Snowking Lakes. Access to Lower and Upper Granite Lakes has been affected by closure of the private road. Alternatives P and R would also increase hiking distance to Slide, Enjar, Lower and Upper Jordan, Lower

and Upper Falls, Marten, Jug, Arrow and Whale Lakes. Cumulatively, 18 of these 25 lakes would have been affected by road closures. The result could be a combination of fewer people fishing, increased use at other lakes with the shortest hiking distance, and people going outside of the area evaluated.

Wilderness Lakes Impacted

With changes in the ease of access, there is concern that the displaced use from Illabot area may contribute cumulatively to impacts at other lakes. It is not known where the people who are displaced from Slide Lake and the other Illabot area destinations would go if Alternatives P and R are implemented. Other wilderness lakes on the southern portion of the District that people might go to instead of Slide Lake include Watson Lakes (Noisy-Diobsud Wilderness), Elbow Lake (Mt. Baker Wilderness), and Found Lakes (Glacier Peak Wilderness).

An increase in use at Watson lakes as a result of displaced use from Slide Lake could result in more impacts to campsites, soils and vegetation that exceed LRMP standards and could cause the average and maximum encounters to exceed LRMP standards. Some sites at Elbow Lake and Found Lakes already exceed LRMP standards for wilderness areas. There has been no monitoring at Elbow Lake since the road closure in 2005 increased the hiking distance to the Lake. An increase in use at Elbow Lake as a result of displaced use from Slide Lake could cause the limits to continue to exceed vegetative loss and damage standards, but not cause the average and maximum encounters to exceed LRMP standards. Increase in use at Found Lakes could result in more sites exceeding limits of vegetation loss and damage. It is likely that none of the lakes in this area would be able to adequately accommodate an increase in use without incurring an increase in impact to campsites, soils and vegetation.

Road Maintenance Costs

The Mt Baker Ranger District has a total of 762 miles of roads of which 445 miles (58%) are open to motor vehicles and require routine maintenance. In 2010 the District was able to perform limited maintenance on 362 miles of road with a 2010 budget of $290,000. No maintenance was performed on 83 miles (18.6%) of open road in 2010. From 2005 - 2010 the District road maintenance budget averaged $151,944 per year.

Limited road maintenance that has been performed for the last 15 years does not include full grading, aggregate surfacing, ditch cleaning, or culvert replacements. In addition, roadside brushing often occurs at intervals longer than 3 years. Costs incurred to maintain roads to standard include the following items.

1. Grading – Full or spot grading.
2. Road Surfacing – Aggregate and Asphalt
3. Ditch Cleaning – The removal of items that block the ditch line like rocks, logs, slumps.
4. Slide Removal – The removal of small area sized slides by hauling to wastes sites.
5. Logging Out – The seasonal opening of roads
6. Culvert cleaning – Removal of obstructions around the inlet and outlet of the culvert. Some internal cleanout if reasonable in size and nature.

7. Culvert replacements up to 36" in diameter and 5 feet deep at centerline.
8. Brushing – Figured on a 3 year rotation for brushing needs.

Road Maintenance Costs to Standard

Based on recent contracts, the average annual cost to maintain a Maintenance Level 3 road to standard is $1,500/mile. For Maintenance level 2 roads, the annual, average cost per mile is $400. Although some cost are incurred to maintain Maintenance Level 1 (closed) roads, the cost is low to none each year and is not used in this analysis. Although the per mile maintenance costs are higher on Road 16 than for the average road, there is no data to identify the actual cost for this road because it has not been maintained to standard for more than 10 years. This analysis will use the average cost since there are no better data.

The annual cost to maintain Road 16 to standard is identical for Alternatives N and U (Table 10). The maintenance cost with Alternative M is only slightly higher because the additional road miles would be maintained only for high clearance vehicles. Alternative R would reduce road maintenance costs by roughly 50% and Alternative P would reduce maintenance costs by 82%.

Table 10. Cost of maintaining Road 16 to standard by Alternative

	Alt. N	Alt. P	Alt. U	Alt. R	Alt. M
Annual Cost	$18,750	$2,250	$18,750	$9,150	$20,550

Road Maintenance Costs for Limited Maintenance

Because the road maintenance budget has not been sufficient to maintain all open roads to standard, reduced road maintenance has been performed on those roads where maintenance has occurred. Limited maintenance costs more accurately reflect the maintenance expenditures that would likely occur with each alternative.

In 2010 the District spent $35,874 to open Road 16 from MP 8.0 to MP 20.5. An additional $2,000 was spent to open Roads 1620 and 1620012 in 2010. This amount of funding did not complete all necessary maintenance work. Another $50,000 was needed in 2010 to complete routine maintenance work and bring these roads to their respective Maintenance Level (ML) standards, but the considerable backlog of deferred maintenance replacing and upgrading culverts, log retaining wall repair, concrete ford repair, road shoulder failures, and reconstruction of ditch lines would not have been addressed. No funds were spent on Road 16 past MP 20.5 due to limited budget and other higher priority district roads needing maintenance at the time. Due to the unsafe and unmaintained existing conditions a rock and earthen barrier was put in-place at MP 20.6 to block the road until sufficient funds can be found to maintain the road to its designated ML 2 condition.

Including the costs from 2010, the average annual cost to perform limited maintenance on Road 16 from 2005 – 2010 was $858 per mile, which is nearly 50% less than needed to perform maintenance to standard for an average road and likely less than 50% of what is needed to maintain Road 16 to standard. Alternatives N and U would maintain the recent

levels of road maintenance expenditures (Table 11). Although Alternative M would retain an additional 4.5 miles of road open to motor vehicles, the average maintenance expenditure of level 2 roads in the Illabot Creek watershed have averaged only $62/mile over the last 6 years. As a result, the cost of performing annual limited maintenance for this alternative would only be slightly higher than Alternatives N and U. The cost of annual limited road maintenance with Alternatives P and R would be $9,432 and $5,501 less, respectively than has been expended in the recent past.

Table 11. Cost of performing annual limited road maintenance on Road 16 by Alternative

	Alt. N	Alt. P	Alt. U	Alt. R	Alt. M
Annual Cost	$10,663	$1,225	$10,663	$5,162	$10,934

Although the upgrades to Road 16 with Alternatives U and M would bring the road to standard, annual maintenance would not retain the road in that condition because full maintenance would not be performed. Road conditions would deteriorate as road ditches and culverts become less functional. Conditions on Road 16 from the Slide Lake Trailhead to MP 25 would deteriorate quickest because Maintenance Level 2 roads rarely receive any maintenance at current budget levels.

Although Alternative N would receive similar maintenance levels, the lack of drainage upgrades and shoulder repairs are expected to result in frequent road closures and repairs that may not be accomplished with available funding.

Alternative P would redirect almost $9,500 of road maintenance funds to other roads. This would allow these roads to be maintained nearer to standards resulting in a more dependable road network. Alternative R would redirect nearly $5,500 to other roads, or to the remaining Road 16, allowing these roads to be maintained nearer to standards resulting in a more dependable road network.

Future funding for road maintenance is expected to be less than what was received from 2005 – 2010. As a result fewer maintenance items can be performed and the gap between the limited maintenance performed and the amount needed to maintain the road to standard is expected to widen. In addition, other programs that have provided funding to address deferred road maintenance like RAC (Secure Rural Schools and Community Self Determination Act of 2000) are unlikely to be available further increasing the gap between road maintenance needs and available resources. As a result, unplanned road closures and less safe road conditions are expected to be more common with alternatives that do not reduce the existing road network.

Although MBRD has either closed or decommissioned more than 200 miles of road with the Finney and Baker Lake/South Fork Nooksack Access and Travel Management decisions, the current annual maintenance needs of $406,800 far exceeds the $151,944 per year that is available to perform road maintenance. Alternatives P and R would continue the trend of reducing the size of the road network to allow higher levels of maintenance on the remaining road system.

Construction Costs

The costs to implement each alternative (Table 12) are road construction costs only. They do not include additional surveys, design, contract preparation and contract administration costs which generally add 25% to the construction costs. Costs shown were estimated using the most recent similar bid items for the Mt Loop and Sauk Road Repair contract of 2009. A detailed cost analysis is filed within the project record.

Items included in the cost estimates include:

- **Culverts** – Each culvert would be checked and evaluated for proper sizing and material type to pass the Q100 year flood requirement plus 10% for debris flow. Additional culverts will be added to divert water more quickly across the road prism.
- **Culverts to Bridges** – Bridge would be installed at Arrow Creek.
- **Culverts to Arch** – Bluebell and Iron creeks and No Name creek would be sized for a conversion to a pipe arch.
- **Ditches** – All ditches would be reconstructed to match design requirements or constructed where needed.
- **Road prism shoulders** – All failing side-casted roadway shoulders would be reconstructed and compacted to regain lost road width and reestablish stability.
- **Wall Structures** – Where necessary retaining wall structures would be constructed to maintain road design width of 14 feet plus curve widening. Wall types could also consist of gabion rock filled baskets, rock riprap walls, mechanically stabilized earthen walls or concrete reinforced walls.
- **Surfacing** – Rock surfacing would be placed where required to meet the passenger car service level requirement for ML 3 roads.
- **Clearing and Brushing** – Where required throughout construction.
- **Concrete Fords –** The 2 concrete fords are failing on the downstream side of each ford. Shoring up and reconstruction is required below each ford to prevent continued loss of material downstream or removal and replacement of each ford.

Additional costs would be required for some alternatives that cannot be estimated without additional survey work. These include under drains to address subsurface water that threatens to saturate road fill and maintenance of log retaining walls. Although these items would add some additional cost to Alternatives U, R, and M, the comparison using known costs is sufficient to demonstrate differences between the alternatives.

Table 12. Construction Costs by Alternative

	Alt. N	Alt. P	Alt. U	Alt. R	Alt. M
Total Cost	$0	$880,074	$3,330,850	$1,870,400	$3,524,908
Upgrade Cost	$0	$286,814	$3,124,790	$1,476,540	$3,477,248
Decommission Cost	$0	$593,260	$206,060	$393,860	$47,666

Impacts to Fish Habitat

Aquatic Habitat – Listed Fish

Overview

To measure road-related risk to aquatic habitats, the expected change to selected aquatic habitat indicators in Illabot Creek under each alternative will be compared. Pool area and residual pool depth are related to the quality of fish habitat and are responsive to changes in sediment input (Lisle 1982, Lisle 1987, Cross and Everest 1995). The percent of fine sediment in spawning gravels has been shown to affect the ability of salmonids to effectively reproduce (Kondolf 2000, Larsen et al. 2003) and is closely related to roads within the watershed (Reid and Dunne 1984).

Table 13. Fish Habitat Issues and Evaluation Criteria

Issue description	Indicator	Measure
Fish habitat quality – Adult migration and maturation	Change in Residual Pool Depth	Mean depth in feet for reach
Fish Habitat quality – Juvenile rearing habitat	Change in Pool area (percent)	Percent Surface area for reach
Fish Habitat quality – Spawning success	Change in fine sediment	Percent of substrate <2 mm for reach

Direct Effects

Alternative N would result in no direct effects with respect to aquatic habitat and listed fish.

Alternatives "U" and "M" would result in local, short-term direct effects to fish and their habitat as a result of the culvert upgraded to a bridge at Arrow Creek. Effects would be limited to several individuals and the length of stream channel that was physically disturbed during culvert removal and stream bed restoration.

Alternatives "P" and "R" would result in local, short-term effects similar to "U" and "M" and in addition fish would be disturbed during removal of the Otter Creek Bridge and during construction of the overflow channel next to Illabot Bridge. Effects to fish would be disruption of feeding and sheltering during the time that heavy equipment was working in the immediate vicinity.

Indirect Effects

Alternative "N" does not treat any roads within the project area and therefore doesn't eliminate any risk of culvert failure, does not reduce miles of road on unstable soils and does not upgrade any culverts or drainage structures. This alternative has the highest risk

of degrading fish habitat due to elevated risk of failures for road sections crossing unstable soils, failure of undersize culverts and would produce the most sediment due to road surface erosion.

The expected result will be sustained levels of disturbance from ongoing (press) effects (Bender et al. 1984), such as road surface erosion. Heavily used native surface roads contribute up to 130 times more fine sediment (Reid and Dunne 1984) than closed roads. This amount of open road will contribute to maintaining the fine sediment levels near the current condition (9.5% in reach 1) which is high enough to have some negative effect on fish reproduction. The risk of pulse disturbance (Bender et al. 1984) due to catastrophic sediment input will remain high; disturbances of this type reset the aquatic habitat to levels which negatively affect fish and will slowly recover over time. There is high risk that this alternative will allow degradation of fish habitat, reducing the residual pool depth and reducing pool area in Illabot Creek.

Alternatives U and M have similar effects on fish habitat and will be analyzed together. These alternatives lower risk of culvert failure by upgrading culverts and drainage on almost half of the post project road system, but they have no appreciable reduction of road segments located on unstable soils (Table 10). Upgrading roads reduces risk of failure by installing larger pipes that are less prone to plugging and failing and properly draining roads to reduce surface erosion. The amount of open road in the analysis is still high and will continuously produce fine sediment that will be routed to fish habitat in Illabot Creek. Improved drainage will somewhat decrease the risk relative to Alternative N, but risk of continued fine sediment production is still high. Upgrading culverts and road drainage will reduce the risk of impacting fish habitat due to catastrophic road failure to moderate. A substantial risk of road failure on unstable soils will still exist.

Alternatives R and P have the greatest benefits to fish habitat. Chance of culvert failure will be substantially reduced on large portions of the road system by elimination of culverts. Several miles of road over unstable soils will be eliminated, reducing the chance of failure at those locations and the remaining road will be upgraded to reduce the chance of failure and reduce the amount of sediment delivered to stream systems (Table 10). Long-term recovery of fish habitat can be expected when one half to two thirds of the risk of catastrophic failure is eliminated. A reduction of twenty eight to thirty eight percent in post project road length will substantially reduced the amount of fine sediment that may be produced from road use. It is reasonable to expect long-term recovery in the depth and area of pools and a reduction of fine sediment in the substrate, all of which will lead to increases in the ability of the habitat to support fish.

Summary

All action alternatives reduce the risk of the road system impacting fish habitat (Table 14). The benefit of each alternative is relative to the reduction of road failure risk to reduce large introductions of sediment. Fine sediment production is greatly reduced by reducing the amount of open road, substantially reducing the continual erosion of the road surface.

Table 14. Summary table of expected risk of reduced fish habitat quality of each alternative by indicator.

Alternative	Change in residual pool depth	Change in pool area	Change in fine sediment
P	Low	Low	Low
R	Low	Low	Moderate
U	Moderate	Moderate	High
M	Moderate	Moderate	High
N	High	High	High

Cumulative Effects
Other decommissioning projects such as the 2005 decommissioning of 13 miles of road on Seattle City Light owned property in the Illabot and O'brien watersheds will lead to cumulative reductions in negative water quality effects. This will occur as a result of the restoration of natural hydrologic processes such as increases in infiltration and shallow and deep groundwater flows and decreases in erosive surface flows. In addition, cumulative effects from re-vegetation of areas of bare road surfacing will provide filtering of sediments that are transported with overland flows, resulting in improved receiving water quality.

Any additional road decommission projects implemented either in the recent past or near future will result in similar effects to this project, generally characterized as the long-term development of populations of plant, invertebrate and vertebrate riparian-dependent species. Removing culverts and pulling back fillslopes on unstable soils will restore riparian habitat that was historically present in these areas, thereby improving connectivity of riparian habitat. Cumulatively improvements in fish habitat could be expected over the long term as upslope restoration activities limit sediment reaching fish habitat and natural processes transport excess sediment out of the watershed.

Erosion and Sediment Delivery to Illabot Creek

Analysis Area

The analysis area for direct and indirect effects on water and soil resources is the Illabot Creek subwatershed (HUC 12 = 171100050802). The area of this subwatershed is 42.91 square miles. It is contained within the Illabot Creek-Skagit River watershed (HUC 10 = 1711000508).

Analysis Approach

The direct and indirect effects of project alternatives were determined in relation to the following factors affecting hydrology, soils and riparian habitat:
Water Quality – Erosion and Sediment Delivery to streams

Water Quantity – Flow Patterns
Soils – Soil Disturbance and Productivity
Riparian Reserves – Riparian Habitat

The environmental effects analyses of project alternatives in these areas of concern are described below. Other relevant aquatic issues were analyzed and are expected to have no measurable impact. Such issues that will not be impacted by this project are wetlands, municipal watersheds, and water temperature. Depending on slope position and proximity to streams, active roads can be chronic sources of fine sediment (Reid, 1981; Reid and Dunne 1984; Bilby, et. al. 1989). Roads that cross or run adjacent to streams are of particular concern due to direct access to streams through the ditch line or short slope distances to adjacent streams. Fine sediment may enter streams and increase turbidity, which affects water quality for water users such as humans or aquatic biota.

Roads that cross unstable soils and known landslide areas are at the highest risk for washout. When road-stream crossings and, in some cases, side-cast material sites fail, road fill material enters stream channels and causes an immediate increase of fine sediment and turbidity. This additional material can also become a chronic source of fine sediment. If road-stream crossings are not removed or properly maintained, the risk of culvert failure could increase due to sedimentation and a reduction in capacity. Road-stream crossings also affect the sediment regime for stream channels, preventing or limiting the delivery of large wood and larger sediments.

Direct and Indirect Effects

Alternative N

The No Action Alternative would leave approximately 12.5 miles of FSR 16 and 3 miles of FSR 1620 in an open and driveable condition. Leaving roads in an open and drivable condition in this analysis area will result in sediment delivery to streams from the following processes:

- Road-related failures would contribute large amounts of sediment in short periods of time due to culvert failures, side-cast and fill-slope failures, and landslides.

- Erosion, sediment transport and deposition would result from flow paths that are altered by a compacted roadbed, culverts, and ditches, which focus and increase the erosive energy of flows against streambeds and banks.

- Sediment from exposed cut-and fill-slopes and road surfaces would enter streams as a result of road use due to mechanisms such as cars raising dust on dry roads adjacent to streams and sediment from car wheels getting washed off in flow over road surfaces at fords.

- Sediment from road surfaces and ditches would be transported to streams through overland flow during rainfall-runoff events.

The principal mechanisms for sediment delivery to streams from roads in the analysis area are surface gravel from exposed cut-and fill-slopes, side-cast and fill-slope failures, and undermining of roadbeds due to gully erosion associated with insufficient drainage. Additionally, a lack of road maintenance has increased the risk of culvert failure, which would provide additional sediment delivery to streams. Unlike the composition of landslide sediments, finer materials including sand and silts are believed to dominate the largest fraction of sediments delivered via roads to stream channels. Most fines are transported from roads to streams during storms that mobilize fine sediments from the road surface. Road drainage is typically delivered to streams through roadside ditches and culvert outlets.

The No Action Alternative would maintain the current erosion potential and sediment delivery from roads in the project area.

Roads that cross unstable soils and known landslide areas would continue to be the highest risk for washout. Approximately 6.4 miles of road would be left on unstable soils. Leaving roads intact on these unstable areas presents a large risk of erosion and sediment delivery to streams, both in the short term and long term. Erosion and sediment delivery to streams will increase turbidity in flowing waters and settle out on the stream bottom in interstitial spaces between the natural streambed material. The result is degraded water quality and an impairment to natural stream morphology.

Road failures are also expected in other road segments that would permanently eliminate vehicular access and the ability to maintain sections of road beyond failure points. The most likely road failure that may not be repairable is at mile post 15.35 on FSR 16. Based on the geology and instability of the underlying soils at this location, it may be unfeasible to reconstruct across this section of road once it fails. Failure of this site has already begun through erosion of the supporting material below the road, and the roadway width is already decreased by several feet. This section of road is expected to no longer provide vehicular access beyond this point within the next 5 to 10 years, which will leave approximately 11.6 miles of road stranded without future access by vehicles or the heavy-equipment needed for road maintenance activities. Without proper maintenance, the likelihood of culvert failure and the resultant sediment delivery to streams is expected to increase in frequency and duration in nearly all stream channels of the project area, which would put Illabot Creek at an increased risk of being designated an “impaired water” under Section 303(d) of the Clean Water Act.

An acute slope failure is more likely to occur under Alternative N than any other alternative. In particular, the configuration of FSR 1600.019 and six culverts in this road are such that if they are not removed, a diversion from blocked culverts will eventually result in concentration of water and a landslide with sediment delivery to Illabot Creek. Increased turbidity in Illabot Creek resulting from acute slope failures has the potential to exceed the natural range of variability of stream turbidity.

On sections of road where vehicular access can be maintained, road maintenance is expected to continue for the foreseeable future with actual levels of maintenance

determined by annual budgets. Given the ongoing declining federal budgets for the foreseeable future, it is likely that maintenance levels will not be able to prevent all culvert and slope failures in the project area. These failures are expected to be chronic sources of turbidity in Illabot Creek and related tributaries.

Effects common to all Action Alternatives

Applying road upgrade treatments will reduce the likelihood of future sediment delivery from current conditions through the following processes:

- Replacing undersized culverts with culverts that are appropriately sized reduces the chances that floodwaters will overtop the roadway or debris will block the inlet and wash out the culvert resulting in sending sediment from above and around the culvert and the adjacent roadway segments into streams.
- Adding new culverts where needed will allow for controlled conveyance of water across the roadway in a manner and location more similar to natural watershed function. This will reduce the potential for 1) ditches to overflow and erode roadway surfaces, shoulders and fillslopes, and 2) water to cross the road and flow in an uncontrolled down slopes to streams, causing hillside erosion and potential slope failures.

Even if a culvert is upgraded and a new culvert installed, there is still a risk that the culvert will fail over the long term. Proper road maintenance is required to ensure stream-crossing structures function effectively with road maintenance funding is become increasingly sparse.

Unstable slopes above and below the roadway will continue to be potential sources of sediment into the future. The presence of unstable soils on slopes above the culvert, under the culvert, or on slopes below the culvert increases the likelihood of slope failure and sediment transport to streams are increased. With upgrade treatments within some project alternatives the continued use of roadway segments located on or adjacent to unstable soils represents a continued risk of erosion, slope failure, and sediment delivery to receiving waters. The only way to completely eliminate this risk is to decommission road segments on or adjacent to unstable soils.

Road decommissioning would eliminate the long-term risk of sediment production in streams from roads and road-side ditches by:

- Reducing future culvert failures, landslides, and road failures.
- Reducing road use by vehicular traffic.
- Reducing road generated overland flow.
- Improving infiltration of water into the ground through de-compaction of road surface.
- Filling in ditches and out-sloping road surfaces.

Heavy equipment excavation is used to remove and install culverts and waterbars. Minor amounts of fine sediment during implementation of road treatment activities and during

the first substantial runoff event. Subsequent runoff events would contribute less sediment production over time but are expected to last up to one year later or until vegetation is established on bare-soil areas adjacent to streams. Design criteria and Best Management Practices will be used to minimize the amount of fine sediment entering stream channels while work is in progress and after the work is completed, including promoting vegetation establishment through seeding and mulch placement.

The amount of sediment delivered to streams is expected to be significantly less than would occur if the roads were left under current maintenance. Cook and Dresser found that stream-crossings that were restored through decommissioning delivered only 3 to 5 percent of the amount of fill material that was originally located at each crossing (2004).

Table 15 provides a summary of the relative risks of the different alternatives on the potential for sediment delivery to streams during construction activities and into the future.

Alternative P:

Alternative P, or the proposed action alternative, includes decommissioning 17.47 miles of roadway and upgrading 5.2 miles of roadway. Alternative P would result in excavation activities for the removal or upgrade of culverts at about 331 locations within the project area.

Table 15: Evaluation criteria for assessing risks to water quality among alternatives

Water Quality Risks	**Measurement Indicator**	**Measurement within each Alternative**				
		No Action Alt. "N"	Proposed Action Alt. "P"	Reduce Alt. "R"	Upgrade Alt. "U"	Marten Lake Alt.“M”
Risk of sediment delivery to streams as a result of construction activities	Number of locations where culvert excavation will occur	0	331	329	311	350
Risk to sediment delivery as a function of road failures in unstable or potentially unstable areas	Length (miles) of road on unstable soils	6.4	3.3	4.7	6.3	6.4
Risk to long-term changes in stream sediment as a function of failure of water crossing structures	Number of stream and spring- crossing structures (culverts & bridges) that would exist on project roads into the future	153	25	64	115	145

The permanent removal of stream-crossing culverts and reestablishment of a natural stream grade is expected to have the most dramatic impact on water quality in this entire project. Alternative P will restore 84 percent of water crossings in the project area that are fed by streams or springs, which are the most active of all water crossings with the highest potential for failure. Only 25 water-crossing structures will be left intact under the proposed action. As such, the proposed action is expected to reduce the potential for the delivery of sediment to streams by nearly 80 percent of current conditions from culvert failures on the most active of all water crossings. These reductions will also prevent gully formation and down cutting through newly excavated stream channels, by establishing a stream bed that mimics the natural stream gradient above and below the crossing, placing cobble-size rock in newly excavated streambeds, and distributing any uprooted vegetation and slash across stream-adjacent disturbed areas.

Furthermore, the proposed action alternative will permanently remove 277 culverts from the project area roads, including 80 culverts on unstable soils. Approximately 74 percent of all existing culverts in the project treatment area would be removed. These road treatments would include removing all culverts beyond mile post 15.35, where the road is currently in eminent risk of failure and would be very difficult to fix. As such, this alternative would enable treatment of all culverts beyond this point before they are cutoff from treatment. To that end this alternative is expected to provide a substantial decrease in stream turbidity in Illabot Creek and numerous tributaries, as well as an improvement of bedload size distribution and channel morphology over the long term.

Approximately 3.1 miles of road on unstable soils would be removed in the Proposed Action. Road segments to be decommissioned within unstable areas will be regraded, which will restore the hillside to a more natural topography. Use of this recontouring technique is expected to minimize post-treatment fillslope failures, which will reduce the long term risk of erosion and sediment delivery to streams from these areas.

Alternative P includes excavation of an overflow channel on the North side of the FSR16 Illabot Creek bridge to prevent uncontrolled bridge overtopping or erosion of bridge approaches due to bridge plugging with sediment and/or debris. This will reduce the potential for excessive amounts of sediment to enter Illabot Creek, and reduce water quality degradation that might have occurred from increased turbidity.

Alternative R

Alternative “R” will upgrade 9.8 miles of roadway and decommission 12.87 miles of roadway, including the conversion of about 5 miles of decommissioned roadway into a new stretch of the Slide Lake Trail. This will restore 58 percent of water crossings that are fed by streams or springs in the project area to provide natural hydrologic connectivity across the hillslope. These restorations are expected to reduce the amount of sediment that would be transported by and deposited in streams by about 55 percent from current conditions, specifically from a reduction of stream culvert failures.

Approximately 64 stream-crossings will remain intact in project roads after construction activities are complete. Over the long term, these crossings still pose a moderate risk of failure and potential increases to stream sedimentation, since road maintenance funding is

becoming increasingly sparse and these crossings are not expected to receive sufficient maintenance or repair over the long term.

A total of 1.7 miles of road that currently cross unstable soils would be decommissioned, but only 0.14 miles of roads crossing unstable areas would be treated with full recontouring to a more natural topography. Recontouring treatments will occur in the section of road 16 beyond the Slide Lake Trailhead. The remaining sections of unstable roadway to be decommissioned are within sections of road 16 that would be converted into the Slide Lake Trail, between mile posts 14.1 and 20.25. Under alternative R, these unstable areas will be treated with sidecast pull-back and hillslope stabilization techniques to reduce the erosion potential from these areas, yet these treatments would not be able to removal all potential for hillslope failures.

Of the 6.4 miles of road that currently cross unstable soils in the project area, Alternative R would maintain 4.7 miles in their current location. These sections of road would be upgraded to improve road drainage and hillslope stability, thereby reducing the likelihood of sediment delivery to streams over current conditions. In comparison, alternative "R" would remove only half of the road on unstable soils than would be removed by Alternative "P". This difference is due to the location of unstable soils relative to the location of road segments to be decommissioned under each alternative, e.g. most unstable soils adjacent to and under the road are located at road locations before MP16 on FSR 16. As such, Alternative R will have an increased chance of sediment delivery over the Proposed Action in both the short and long term, but these risks to sediment delivery are improved over the No Action Alternative.

Similar to Alternative P, Alternative R includes excavation of a pilot channel on the North side of the FSR16 Illabot Creek bridge to prevent uncontrolled bridge overtopping or erosion of bridge approaches due to bridge plugging with sediment and/or debris. Construction of this pilot channel will reduce the potential for excessive amounts of sediment to enter Illabot Creek, and reduce related water quality degradation due to increased turbidity.

Alternative "U":

Alternative U will upgrade nearly 16 miles of road and decommission 6.72 miles of road. The Upgrade Alternative will restore 25 percent of water crossings that are fed by streams or springs in the project area, and these restorations are expected to reduce the amount of sediment that would be transported by and deposited in streams by 24 percent from current conditions, specifically from an expected decrease in stream culvert failures.

More importantly, 115 stream-crossings, or 75 percent of the current stream-crossings, will remain in the open and driveable portions of project roads after construction activities are complete. In the short term, these culverts will be maintained or upgraded to allow for sufficient passage of the estimated 100-year flow plus sediment and debris, which will improve stream morphology and turbidity levels in the analysis area over the current conditions. Over the long term, these crossings still pose a moderate to high risk of failure and potential increases to stream sedimentation, due to the high number of crossings left intact and expected funding. Road maintenance funding is becoming

increasingly sparse, so these crossings are not expected to receive sufficient maintenance or repair over the long term and will have an increased potential for failure.

The Upgrade Alternative will remove no culverts from unstable areas and only 0.1 miles of road on unstable soils would be decommissioned on road 16 beyond the Slide Lake Trailhead, between mile posts 23 and 25. These unstable areas will be treated by recontouring the road to restore the hillside to a more natural topography and reduce the likelihood for hillslope failure. The remaining 6.3 miles of road located on unstable slopes will be upgraded to improve road drainage and hillslope stability, thereby reducing the likelihood of sediment delivery to streams over current conditions, particularly in the short term. Yet, as discussed before, roads that cross unstable areas will always pose an increased threat of sediment delivery to streams from eroding slopes and road failure. Since Alternative U will leave 6.3 miles of the current 6.4 miles of road in unstable areas, this alternative is expected to have an increased chance of sediment delivery over alternatives P and R in both the short and long term, but these risks to sediment delivery are improved over the No Action Alternative due to proposed upgrade treatments. Alternative M is the only action alternative expected to exceed the Upgrade Alternative in terms of risks of road and culvert failure from unstable areas, but the risks from these two alternatives are considered very similar with moderate risks of sediment delivery in the short term and high risks in the long term.

Alternative "M"

The Marten Lake Alternative will permanently remove 17 culverts from project roads, 8 of which provide crossing for streams or springs, and none of which are located on unstable soils. This alternative would upgrade the entire 6.4 miles of road currently located on unstable soils to improve road drainage and hillslope stability, thereby reducing the likelihood of sediment delivery to streams over current conditions, particularly in the short term. Over the long term, the risk of sediment delivery from unstable areas with roadways left intact is expected to be high. This alternative is expected to have the highest chance of sediment delivery over all other action alternatives in both the short and long term, and these risks are considered very similar to Alternative U with moderate risks of sediment delivery in the short term and high risks in the long term.

Upgrading 20.7 miles of roadway, including the 6.4 miles on unstable areas, will provide a large reduction of short term risk of erosion and sediment delivery to streams from current conditions. This alternative will upgrade 145 stream or spring fed culverts, which will reduce the short term likelihood of overtopping or culvert failure, thereby reducing the amount of sediment delivered to streams. However, leaving these culverts intact over the long term will pose a high long term risk of erosion and sediment delivery, due to the high number of culverts and road maintenance funding. Road maintenance funding is becoming increasingly sparse, so these crossings are not expected to receive sufficient maintenance or repair over the long term and will have an increased potential for failure. As such, Alternative M is expected to pose the highest risk to stream sedimentation over

the long term of all action alternatives, but these risks would still be less than the No Action Alternative due to upgrade activities.

Summary

Currently, erosion and road failures are providing an unnatural contribution of additional sediment to streams in the project area. The No Action Alternative poses a significant threat to stream turbidity and natural channel processes in both the short and long term. All proposed action alternatives will reduce these threats, most dramatically in the short term. The proposed action alternatives will have varying efficacy to reduce stream sedimentation over the long term based on the treatments proposed and their relative location on the landscape. The most significant source of erosion and sediment delivery to streams in this project will come from sections of roads that cross unstable areas in the short term and from culvert and road failures in the long term. Table 16 summarizes the risks of erosion and sediment delivery in the short and long term that are expected from each alternative, which has been broken into the risks within and outside of unstable areas.

Table 16: Summary of expected risk of erosion and sediment delivery to Illabot Creek following implementation of alternatives

Types of Risk	Alt. N	Alt. P	Alt. R	Alt. U	Alt. M
Short Term Risk Due to Culvert Overtopping or Road Failure outside Unstable Areas	High	Low	Low	Low	Low
Short Term Risk Due to Culvert Overtopping or Road Failure on Unstable Soils	High	Low	Moderate	Moderate	Moderate
Long Term Risk Due to Culvert Overtopping or Road Failure outside Unstable Areas	High	Low	Moderate	Moderate to High	High
Long Term Risk Due to Culvert Overtopping or Road Failure on Unstable Soils	High	Moderate	Moderate to High	High	High

Risk categories were assigned based on all the proposed treatments within each alternative, the number of culverts left in the roadway after treatment, and the previously discussed road maintenance activities. As culverts are removed through decommissioning, both the short and long term risk of sediment delivery are eliminated. If culverts are upgraded, the short term risk is reduced, with a greater reduction for culverts and roadways outside unstable areas. The long term risk of culvert or road

failure increases over time and with more culverts left intact. The highest risk of sediment delivery is expected from sections of road that cross unstable areas that will have a roadway intact after treatment. Based on these categories, Alternative P would provide the lowest risk of delivering sediment to streams following implementation, while Alternative N would result in the highest risk. The ranking of all alternatives from highest risk to lowest risk of delivering sediment to streams: Alternative N, Alternative M, Alternative U, Alternative R, and then Alternative P.

Cumulative Effects

The analysis area for cumulative effects on water quality is the Illabot Creek watershed. The 2005 decommissioning of 13 miles of road on Seattle City Light owned property in the Illabot and O'brien watersheds will add to long term cumulative reductions in water quality effects. This will occur over time as a result of the restoration of natural hydrologic processes such as increases in infiltration, increases in shallow and deep groundwater flows and decreases in erosive surface flows. In addition, cumulative effects from re-vegetation of areas of bare road surfacing will provide filtering of sediments that are transported with overland flows, resulting in improved receiving water quality.

Continued management of areas designated as "Late Successional Reserves" in the Illabot Watershed is not expected to cause cumulative effects related to erosion and sediment delivery to streams.

There are two unstable sections of Road 1620 that are not included in the alternatives – MP 3.3-3.8 and MP 4.9-6.39. While the MP 3.3-3.8 road segment is outside of the Illabot Watershed, failure of this road segment will limit access to the MP 4.9-5.0 segment, which is within the Illabot watershed. Terrain, soils, geology, and hydrology of both of these road segments cause them to be hazardous to drive, unstable, and potential slope failure locations.

None of the alternatives include actions beyond MP 3.0 on FSR 1620. The unstable segment of FSR 1620 from MP 5 to its end at MP 6.39 is within the Illabot Watershed, has been put into storage, and the continued risk of slope failure result in a slope failure that affects Road 16 where it crosses Iron Creek.

This cumulative effect may occur with all alternatives except Alternative P, since all alternatives except Alternative P involve keeping the FSR 16 segment through the Iron Creek ravine open and none involve treating FSR 1620 beyond MP 3.0.

Environmental Effects of Other Issues

Recreation

Local Economy

Alternatives N, U, and M are expected to have no impact on economic activity as long as road access to the Slide Lake trailhead is available. Alternatives N and R may result in a decrease of an estimated $6,000 in spending between four communities. Because this level of economic activity is small, it is not expected to be detectable and is unlikely to affect the economies of local communities.

Roads

National Roads Policy

In 2000 the National Roads policy directs each National Forest on how forest roads are to be managed. The policy directs managers to ensure an economical road system to match budgets, to meet standards for the roads management level to ensure safe travel, and to protect forest resources. Alternatives P and R would best meet the Roads Policy by moving towards a road network that is more in line with current and projected budgets. These alternatives also would improve road safety and be less impactful to water quality.

Alternatives N, U and M would be less consistent with Roads Policy since there would be no reduction in the gap between maintenance needs and projected road budgets. Alternatives U and M would at least initially meet maintenance level standards and be less impactful to water quality. Alternative N would achieve none of the policy objectives.

Road Failures

Road 16 has shoulder failures along the majority of the road from MP 8.0 to MP 20.0. These sites need reconstruction to regain road width, add structural stabilization and prevent continued loss of material. Two concrete fords have lost large amounts of material below each site resulting in head cutting of the drainage up and encroaching under each site. At MP 15.3 an active slide has reduced road width to 13’ with no shoulder. At this site there is a large rock face on the uphill side will require the construction of a large retaining wall structure along existing road if a solid rock foundation can be found during excavation. A shift into the hillside would require removing large amounts of the vertical rock face and would be cost prohibitive. There is a high risk for total failure and road loss at anytime and may not be repaired if a solid rock foundation can’t be found below the existing road prism.

The risk of total road failure that would eliminate vehicle access to the Illabot watershed and potentially degrade water quality and fish habitat is very high if Alternative N is implemented. There are multiple factors that could result in this type of large road failure that will not be addressed. Alternatives U, R, and M greatly reduce the risk of a large road failure by replacing and upgrading road drainage and by anchoring retaining walls into bedrock. However, there may be some sites where bedrock is not sufficiently near to anchor retaining walls and the risk of a large scale road failure will still exist at these

locations. Even with the large investment in upgrading the road with Alternatives U and M, there would remain a fairly high risk that the road will be lost at one site where repair would be cost prohibitive. By decommissioning Road 16 beyond MP 9.5, Alternative P will eliminate most risk of a large road failure. A risk will still exist between MPs 8 and 9.5 that could temporarily eliminate vehicle access.

Hydrology

Water Quantity – Alteration of the hydrologic cycle / Increased peak stream flows

Road stream crossings alter locations, volumes, velocities and timing of water and sediment movement. Roads are impervious surfaces which reduce infiltration of precipitation into the ground and increase surface runoff.

Shallow subsurface flow that would normally be conveyed below the ground surface within the hillside to enter the stream over longer periods of time and at lower volumes and velocities may be intercepted at road cut-banks and converted to rapid surface runoff. This process effectively increases drainage density in a watershed, which can indicate increased peak flows (Wemple et al., 1996; WFPB 1997).

Wemple et al. proposed that roads modify drainage density by extending the total length of effective surface flow, extending the stream channel network. Where roads cross streams, they route the captured water flows to streams again acting as extensions of the stream channels. This has two effects. First, it decreases the time it takes water to reach streams and increases peak flows. Second, water captured by the road's surface and ditches sometimes carries fine grained sediments to the streams, and increases the amount of fine grained sediments in the streams (a water quality effect). Increases in peak flows (flood frequencies) from impervious surfaces cause detrimental in-stream effects such as streambed scour and bank erosion.

Stream channel network extensions from roads were estimated to range between 4 and 10 percent in the Illabot Creek subwatershed. Drainage network increase is considered at a moderate risk when increases are estimated between 10 and 20 percent. This level of risk indicates a moderate likelihood that sediment transport and streamflow, particularly high flows, are increased as a result of existing roads.

Direct and Indirect Effects

Alternative "N":

Road-related drainage network extensions have been decreasing over time in the Illabot Creek subwatershed due to past road decommission projects and increased number of culverts. This trend is expected to level off to zero under the no action alternative, as road decommissioning would not be pursued on any roads of the Illabot Creek subwatershed in the foreseeable future under this alternative. The number of stream crossings that will exist in the road prism into the future can be used to assess the impacts to drainage network extension under each alternative. Table 17 summarizes the resultant changes to Drainage Network Increases in relation to each alternative within the Illabot

Creek subwatershed. The results are in direct correlation to the number of road-stream crossings that would remain intact and have the ability to contribute additional surface drainage to streams in the watershed after each alternative is implemented.

All action alternatives are expected to reduce the drainage network extensions from current conditions, particularly as a result of road decommissioning activities. These reductions are in direct relation to the reduction in the number of stream crossings that will continue to exist within the road prism. Alternative P would nearly eliminate all existing increases in drainage network extension, as seen by the resultant drainage network increases of only 1 to 2 percent (Table 17). Alternatives R and U would have smaller improvements to the drainage network, all of which would improve drainage network increases into low levels, since they would all be below 10 percent. Although Alternative M would remove impacts of drainage network increases from 9 stream crossings within the subwatershed, this impact would be barely measurable from current conditions.

Project design features and Best Management Practices will be used in all action alternatives to further improve reductions to drainage network increases. Sections of road to be upgraded will gain additional ditch relief culverts, which will improve road drainage and disperse more water onto vegetated hillslopes, thereby reducing the length of road that may collect and outflow into streams.

Table 17: Changes to Drainage Network Extension as a result of the Illabot Road Project.

Alternative	Length of road decommission (miles)	Number of road-stream crossings within the watershed afterward	Percent increase in Drainage Network Extension from natural conditions	
			With 200 ft to next culvert	With 500 ft to next culvert
N	0	125	4%	10%
P	17.47	26	1%	2%
R	12.87	53	2%	4%
U	6.72	94	3%	8%
M	1.97	116	4%	10%

Cumulative Effects

The proposed action and any of the other alternatives that include decommissioning of road segments, when implemented in conjunction with other road decommissioning projects such as that undertaken by Seattle City Light in 2005 will contribute to a cumulative decrease in drainage network density and restore hydrologic flow patterns within the larger project area. Road decommissioning activities are the primary actions expected to affect flow patterns by removing road-stream crossings and ditches. No road

decommissioning projects other than the proposed action are known to currently be planned.

Soils - Soil Displacement and Productivity

The creation of roads has resulted in soil compaction, puddling, displacement (removal of topsoil), surface erosion and mass wasting and has therefore resulted in decreased soil productivity. Effectively, road construction is a long-term commitment of the soil to use as a road. Returning soil to its original productivity after use as a road is a chemical, physical, biologic, and geologic process that can take hundreds of years. Soil productivity begins to return after road closure to vehicle travel, allowing some vegetation to grow within a year. Furthermore, the potential for future landslides from unstable road sections has the potential to degrade soil productivity conditions beyond the road prism.

With all alternatives, the amount of soil disturbance in the Illabot Creek subwatershed, specifically from roads, measures less than 1 percent of the subwatershed area, which is well below the Forest standard that states detrimental soil conditions should not exceed 20 percent of an activity area.

Soil productivity would gradually recover on decommissioned sections of roads. Decommissioning roadbeds would not create any additional soil compaction and displacement because excavated soil would be limited to the previously compacted and disturbed roadbed. The potential for soil displacement of the road would be reduced because unstable side-cast material at stream crossings would be moved to a more stable location. Road closure activities are not expected to change current soil compaction and displacement conditions of affected roads. Reducing road density through decommissioning would reduce adverse effects on soil productivity.

Riparian Reserves – Riparian Habitat

Riparian habitat is affected by roads when they are conincident, typically when roads occur along stream or at stream crossings. Some riparian habitat has been altered or eliminated during road construction. Riparian habitat removal results from vegetation removal and soil displacement. Road construction also changes water drainage patterns by capturing sub-surface flow along cut-banks and removing shade.

Current Condition

There are approximately 13 square miles of Riparian Reserves in the 43 square mile Illabot Creek watershed (approximately 30 percent of the watershed). Approximately 6.4 miles of the roads within this project are located in Riparian Reserves. Assuming a roadway width of 12 feet, the area of riparian reserves occupied by study area roads would be 9.3 acres.

Based on a review of the NMFS (1996) and USFWS (1998) measures for road density and location and riparian reserves, subwatershed conditions are currently classified as "functioning appropriately".

Direct and Indirect Effects

Alternative "N":

Under the No Action alternative, the road will remain open and drivable until a road failure occurs. Riparian Reserves are not expected to improve from current conditions in the short term (e.g. 5-10 years) and will likely not recover to full function in the long term. Road failures are likely at FSR 16 MP8.4 – 9.5, MP 15.475, MP17.35, and MP 20.7-21.2. Riparian Reserve areas would slowly become vegetated beyond the road failure site, but only brush and alder is expected to grow in the road prism due to the road surface compaction. The soils in these areas would remain compacted for many years into the future, and these areas are not expected to produce large conifer trees for a long time, i.e. over 50 years.

The No Action Alternative would allow for continued access to Slide Lake, Enjar Lake, and the trail that leads to and connects these lakes. Vegetation would continue to be affected and out of compliance with LRMP guidelines at three campsites. Garbage, remnants of campfires and sediment would likely enter the lake, degrading biota around and in the lake. Alterations of hydrologic and geomorphic processes would persist.

Effects of all action alternatives

Table 18 shows miles of road in Riparian Reserve that would be decommissioned by each alternative. Alternative 'P" will restore the largest area of riparian reserves. Removing culverts and pulling back fillslopes on unstable soils will restore riparian habitat that was historically present in these areas, thereby improving connectivity of riparian habitat. Decompaction of the road surface and subsequent vegetative growth will also improve habitat. Alternatives R would provide the second largest restoration of Riparian Reserve and Alternative U much less. Alternative M would restore no Riparian Reserve, the same as Alternative N.

Table 18: Alternative Analysis – Riparian Reserves

Alternative Element	Proposed Action Alt. "P"	Reduce Alt. "R"	Upgrade Alt. "U"	Marten Lake Alt. "M"
Road Length in Riparian Reserves that is decommissioned (miles) (Current Length in Riparian Reserves = 6.4 miles)	5.6	3.7	1.1	0
% of road in Riparian Reserves that is decommissioned	88%	58%	17%	0%

Sub-watershed scale effects

Examination of recent (2008) air photos and GIS mapping for the Illabot subwatershed indicates that, at the subwatershed scale, the riparian reserve system is meeting the Riparian Reserves criteria that would classify it as functioning properly (e.g. adequate

shade, large woody debris recruitment, etc…). This is not expected to change as a result of any of the alternatives.

Summary

Positive effects are expected for Riparian Reserves as a result of road decommissioning. Alternatives that decommission longer lengths of road in Riparian Reserves will result in proportionally greater positive effects. These effects will primarily result from re-vegetation of roaded areas near stream crossings and restoration of natural hydrologic, geomorphic and ecological processes in these areas.

There are considerable differences in the percentages of road in riparian reserves that are decommissioned under the different alternatives. However, when viewed against the NMFS and USFWS measures, the magnitude of the positive effects from any of the alternatives is expected to be relatively small when viewed on a subwatershed-scale, since overall, watershed conditions are functioning appropriately.

Negative effects on Riparian Reserves associated with hiking and camping at Slide and Enjar Lakes and Otter Creek are occurring due to vegetation loss, garbage, remnants of campfires, increased sediment influx to the lakes, and altered hydrologic and geomorphic processes. Reduction of negative effects to Riparian Reserves would be the greatest for Alternative "P", followed by Alternative "R". Current negative effects would continue under Alternative "U", "M' and the No Action Alternative.

Cumulative Effects

Conservation acquisition of property and improvement of off-channel habitat within the lower Illabot Watershed will have a positive cumulative effect on riparian function in the Illabot Watershed. While these actions are outside of the National Forest boundaries and therefore do not occur within designated Riparian Reserves, when combined with alternatives that involved road decommissioning, there will be a positive cumulative effect that results. The effect will be small however, as much of the riparian area is functioning appropriately, and the riparian improvements will occur over longer periods of time as plants grow back.

Wildlife

Federally listed Threatened and Endangered Wildlife Species

Alternative N will have no impact on spotted owls or their habitat. All other alternatives would have no effect to spotted owl habitat, including critical habitat, but have the potential to adversely affect nesting spotted owls on 170 acres of potential nesting habitat due to noise disturbance as a result of heavy equipment operation. The likelihood of adverse effects occurring is very small because the chance of a nest in an average size home range of 4,270 acre home range occurring in these 170 acres is very low.

None of the alternatives would affect potential habitat for nesting marbled murrelets. All action alternatives have the potential to adversely affect marbled murrelets in 170 acres

of potential habitat due to noise disturbance as a result of heavy equipment operation. Alternative N would have no impact due to noise disturbance.

There would be no change in habitat suitability for gray wolf with all alternatives. Alternative N and M would have no effect to grizzly bear or its habitat. Alternatives P, R, and U would beneficially affect grizzly bear habitat suitability through the creation of additional core area. Although habitat conditions are believed suitable for grizzly bear recovery with all alternatives, Alternatives P, R, and U would increase use of habitats near roads that would be decommissioned and reduce the likelihood of grizzly bear mortality should the area become occupied by grizzly bear.

Regional Forester's Sensitive and Survey and Manage Wildlife Species

All alternatives would have no impact to peregrine falcon, common loon, and larch mountain or Van Dyke's salamanders due to a lack of suitable habitat. There would be no impact to bald eagle winter night roosts because they are located at least ¾ mile from the nearest proposed activity. There are no impacts expected for survey and manage species or shiny tight coil snail because surveys failed to detected them in potentially suitable habitat that would be affected by project activities. All alternatives would not impact Johnson's hairstreak butterfly because there would be no change in suitable habitat.

No alternative would directly impact harlequin duck or its habitat. All alternatives may indirectly impact harlequin duck habitat in Illabot Creek through sediment production from road failures or from sediment generated by decommissioning and/or major drainage upgrades. Large sediment pulses to Illabot Creek could locally affect marcroinvertebrate populations that are prey for harlequin ducks. The risk of sediment pulses is least when roads are decommissioned, lowered by road and drainage upgrades, and highest with Alternative N, which does not reduce the risk of large road failures. All alternatives may impact individuals or habitat due to increased sediment in Illabot Creek, but will not likely contribute towards federal listing or cause a loss of viability to the population or species.

Alternative N would have no impact on big-eared bat. Alternatives P, U, R, and M would convert 0.5 to 1.5 acres of young forest to a parking lot and/or a waste storage area. Because the change in foraging habitat is so small and the species is not habitat specific, these alternatives may impact individuals or habitat, but will not likely contribute towards federal listing or cause a loss of viability to the population or species.

Wolverine habitat is limited to areas with a snow pack that persists into late spring (mountain hemlock plant associations and higher). None of the alternatives would modify wolverine habitat. Because habitat would not be affected, all alternatives would have no impact on wolverine.

Management Indicator Species and Neotropical Migratory Birds

Mountain goat habitat would not be affected by any alternative. Since there is no hunting season for mountain goat in this area, the change in access would not impact mountain goat survival. All alternatives would have no impact on mountain goat populations.

Because there would be no change in woodpecker habitat, Alternative N would have no impact to woodpecker populations. Alternatives P, U, R, and M would convert 0.5 to 1.5 acres of young forest to a parking lot and/or a waste storage area. This young forest provides no nesting opportunities, but is low quality foraging habitat. Because there are thousands of acres of high quality foraging habitat in the Illabot Creek watershed, the loss of no more than 1.5 acres of low quality foraging habitat is not expected to impact woodpecker survival or reproduction rates. As a result, these alternatives are also expected to have no impact on woodpecker populations.

Because there would be no change in pine marten habitat, Alternative N would have no impact to marten populations. Alternatives P, U, R, and M would convert 0.5 to 1.5 acres of young forest to a parking lot and/or a waste storage area. This young forest provides low quality foraging habitat. Due to the lack of large snags and little down wood, this young forest area does not provide resting/denning habitat. Because there are thousands of acres of high quality marten habitat in the Illabot Creek watershed, the loss of no more than 1.5 acres of low quality habitat is not expected to impact marten survival or reproduction rates. As a result, all action alternatives are also expected to have no impact on marten populations.

All alternatives would have no impact on populations of management indicator species. Because there would be no change in populations, all alternatives would have no effect on population viability of these species.

Alternative N would not impact migratory bird habitat and would have no impact on their populations. Alternatives P, U, R, and M would convert 0.5 to 1.5 acres of young forest that is habitat for some migratory bird species.

Wild and Scenic Rivers

None of the alternatives will affect the status of Illabot Creek as a recommended Wild and Scenic River under the Forest Plan or affect the likelihood of its designation. Alternatives P and R would make public access to Illabot Creek more difficult, but would continue to provide undeveloped river access to boaters. Designation as a recreation river refers to levels of development allowable, but does not affect the ability of the Forest Service to manage system roads, nor does it conflict with the proposed action to close the road.

Management Indicator Fish

Throughout the Mt. Baker-Snoqualmie National Forest (MBS), there are eight fish species recognized as Management Indicator Species (USDA 1990), displaying both anadromous and resident life histories. These fish generally depend on cold, clean water, appropriately sized spawning gravels, and a variety of slow- and fast-water habitat types to meet their needs at various stages of their lives. Table 19 shows the miles of habitat where these fish species have been documented to occur on the MBS.

Table 19. Miles of documented presence on the Mt. Baker-Snoqualmie National Forest by fish species of interest.

Fish species	Miles of documented presence on the MBS[1]
Chinook salmon (*Oncorhynchus tshawytscha*)	106
Bull trout (*Salvelinus confluentus*)	560
Steelhead (*Oncorhynchus mykiss*)	379
Coho salmon (*Oncorhynchus kisutch*)	524
Pink salmon (*Oncorhynchus gorbuscha*)	220
Chum salmon (*Oncorhynchus keta*)	121
Cutthroat trout (*Oncorhynchus clarkii*)	763
Rainbow trout (*Oncorhynchus mykiss*)	503

[1] *From WDFW 2002; does not include miles on National Forest System land with "suspected" occupancy, or on other land ownerships.*

The MBSNF management indicator species are Chinook, steelhead, bull trout, coho, pink, chum, sea-run cutthroat, rainbow, and resident cutthroat. All MIS fishes could occur in the project area. Up to 10.7 miles of habitat (from the mouth up to the road 16 bridge) in Illabot Creek could be influenced by this project. Since all action alternatives would result in some habitat improvement over the current condition, proposed activities would not affect the Forest-wide viability of these populations and would provide varying levels of habitat protection. Alternative N would perpetuate elevated risk of negative impacts to fish and 10.7 miles of MIS fish habitat would remain unchanged. Alternative N would not affect Forest-wide viability of MIS fish populations, but would not provide full habitat protection for MIS fishes.

Fire and Fuels

In the Illabot Creek watershed, 93% of the area is greater than ½ mile from a road and fire suppression in this area would not be affected by any of the alternatives. Alternatives N and M would result no meaningful change to current initial attack and extended attack suppression response. It is anticipated that roads would continue to be under-maintained, and accordingly a degradation of public and suppression access would continue, with a net neutral result.

Alternative U would decrease access for fire suppression crews on 2,205 acres (2% of the watershed) due to reduced initial attack vehicle access on the decommissioned portion of Road 16 increasing the risk of an uncontrolled wildfire should a start occur in this small area. Alternatives P and R would have net benefits on wildfire occurrence on 3,083 and 1,099 acres, respectively, due to the reduced likelihood of human caused fires.

None of the alternatives are expected to meaningfully affect the ability of the fire management program to manage wildland fire within the project area in a cost effective manner. Therefore, they would not contribute to cumulative effects associated with the reduction of road access to Forest lands.

Rare and Invasive Plants

Because suitable habitat is absent there will be no impact to Sensitive or Survey/Manage species with any alternatives. Because there would be no impact, there would be no cumulative effects.

With all alternatives, eradication of invasive plants is expected. Invasive plant populations would be treated as funding allows, however, these sites would be a high priority because there are few invasive plants on National Forest land in the drainage. It would take several years of treatment, but eradication of them is likely.
The mitigation measures are expected to prevent introduction of new invasives and the spread of the infestations already on site alternatives P, U, M, and R.

What differs among the Alternatives is the likelihood of new infestations based on vehicular access to the watershed. Roads can be primary vectors for plant invasions because they provide access to remote sites for vehicles which can carry seeds and and roads provide open, disturbed habitats easily exploited by invasives (Tyser and Worley, 1992; Parendes and Jones, 2000; Lesica et al., 1993; Hodkinson and Thompson, 1997; Lonsdale and Lane, 1994; Schmidt, 1989). Reinfestation of the watershed with invasive plants is likely with Alternatives N, U, and M. Because alternatives P and R eliminates miles of road now open to vehicles, there is a lower likelihood of new invasions over time, both because of the absence of vehicles and the re-growth of native vegetation on the road bed.

There are currently no invasive plant-related projects in the Illabot drainage or adjacent drainages which overlap with this project spatially or temporally which, cumulatively, would have an effect on the invasive plants.

Heritage Resources

There are no identified cultural resources or traditional cultural properties listed, or eligible for listing, on the National Register of Historic Places, therefore, there are no effects expected to these resources. If resources that were not detected by surveys are discovered during implementation, the project will be stopped and redesigned to avoid or mitigate any further impacts.

Alternatives P and R would add to the trend of reducing areas accessible by vehicles for Tribal members to engage in their traditional guardian spirit religious activities. These alternatives also add to the trend of more areas potentially without intrusion of visual and audible disturbances. Alternative N would not change current vehicle access in terms of the ease of accessing sites to conduct religious activities in the short-term, but it could be reduced in the near future if a road failure can't be repaired. Alternatives M and U would provide a barely measurable reverse in the trend decreased vehicle access to lands which are available for religious practices (primarily public domain lands).

The rights reserved under the Treaty of Point Elliott for Tribal members to access National Forest System lands and exercise treaty rights would be unaffected by all

alternatives. Changes in road networks can affect how reserved Treaty rights are exercised in a specific area. Affects may be positive or negative. Alternatives P and R would make it more difficult to exercise treaty rights by reducing vehicle access to higher elevations in the Illabot Watershed, but may increase the ability to exercise treat rights in lower elevations by increasing the number of harvestable salmon. Alternatives N, M, and U would retain or increase the ease at which Treaty rights can be exercised in the high elevations, but result in continued limitation of the ability to exercise Treaty rights at lower elevations by lower harvestable salmon populations.

Environmental Justice

The proposed action would have no effect on human health, wildlife, or fisheries. There is no expectation that the proposed action would disproportionately affect minorities, low-income residents, or Native Americans.

Forest Plan Consistency

The proposed action will meet the standards and guidelines for affected resources in the Forest Plan, as amended (USDA Forest Service 1990). See the "Forest Plan Consistency" section of each Specialist Report for specific information:

- Wildlife
- Fisheries
- Botany
- Heritage Resources
- Hydrology and Soils
- Wild and Scenic Rivers
- Fire and Fuels
- Engineering

Therefore, the proposed action is consistent with the Forest Plan.

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